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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. AUGUST 17, 1899. CHICAGO, ILL. NUMBER 33

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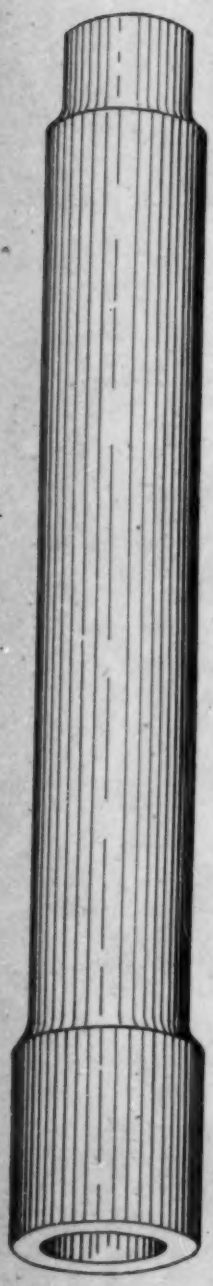

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. AUGUST 17, 1899. CHICAGO, ILL. NUMBER 33

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Another week of heavy buying of foundry iron for delivery in 1900 has passed. Large contracts have been closed in the Chicago, Buffalo, Cleveland and Cincinnati districts, and some furnaces have now booked so much iron for the first half of next year that they prefer to take a breathing spell before taking on more. The Central and Western districts continue to be more active in providing for next year than the East. The leading Southern interest has sold from 150,000 to 175,000 tons for delivery next year and in the past two days advanced No. 2 foundry from $15 to $15.25, Birmingham. There is an approach toward equilibrium in pig iron production and consumption. The Aug. 1 estimate of active blast furnace capacity was 267,672 tons, an increase of 4,300 tons a week over July 1. Actual furnace output in July, however, was reported slightly less than in June. Reductions of stocks in July were 27,000 tons, plus 8,300 tons from warrant yards, and stocks reported to the Western Pig Iron Association Aug. 1 were 153,000 tons. Consumption, including exports, is apparently at a yearly rate between 13,500,000 and 14,000,000 tons, while the full effect of to-day's high prices will not be felt by ultimate consumers until next year, so that there is no sign of a halt in the pace. Implement makers are reasoning that the high prices will make a difference in the farmer's buying and are only contracting for a portion of the requirements they so freely placed last year. But all calculations based on the belief that the ultimate consumer will buy less at these prices should take account of his greatly enhanced purchasing power. At all events the shrinkage, if any, will be a matter of 1900; and it requires a larger knowledge of the world's needs and of the amount of iron and steel buying that can be postponed, than is anywhere available to-day, to predict that even in 1900 the high prices now ruling will cut down consumption materially. The outlook from the standpoint of the large steel interests is stronger with each week. The capacity to produce Bessemer pig iron has been the controlling factor in the steel market. Bessemer iron is sold at $21 valley furnace, but the market is inactive because steel companies have iron now due them that they cannot get, and are little disposed to buy for 1900 when they know that deliveries on iron already bought will run well over into the new year. The output of steel works has been curtailed in the week by shortage of iron and more will be heard of this in the next four months. Some Bessemer has been sold in Pittsburg for shipment to a district long indepednent of Pittsburg and valley furnaces. So far as Pittsburg is concerned the scarcity of material seems to be acecented with each week. Steel has sold at $36 for Bessemer, and open-hearth billets have brought as high as $45. The large producers find in some cases that estimates of output in mid-summer have been beyond the actual, and are now revising the dates to which they are sold ahead, making them later. Plate, structural material, steel bar and bar iron capacity are practically taken up for this year. Certain plate mills are full for six months into 1900. Sheets offer best deliveries of any finished line. It seems useless to speculate on the possibilities of a turn in the tide, when mills and furnaces can wait four months practically without hearing of an order. One source of demand that promises to exceed in 1900 its record for this year is railroad equipment. The car and locomotive supply is proving inadequate to the demand upon it in many sections, and the enormous railroad earnings will not go to larger dividends but to betterments. These, both in trackage and in rolling stock, promise to reach prodigious proportions.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, Aug. 16.

The entire inadequacy of furnaces to supply sufficient Bessemer pig rion for steel making requirements is being further emphasized and has lent additional strength to the market in the past week. It is really difficult to say what would be the condition of the general iron and steel market were a sufficiency of pig iron, of all grades, to be had. It is quite possible that such a supply would decidedly change the complexion of the finished material market. While this may be the case, it does not affect the strength of the market, because of all iron and steel operations, that of making pig iron has been shown to be the least flexible.

The market is particularly unsettled at the present time because all selling of Bessemer pig iron has been suspended by the Valley furnaces pending a meeting Saturday next, at which a basis will be fixed for sales for delivery during next year. The general market is so well sold up, and is so far behind on deliveries, that interest centers largely in the future rather than the present. Operations at steel works have been more impeded in the past week than formerly, by the shortage of iron, and the finishing mills in turn have been affected in proportion. There is a general desire to take hold for next year's business, but pending further information from producers of raw material business is retarded. It is probable that when matters are cleared up there will be some wholesale buying for next year's delivery in all lines.

The disturbance of relations usually existing between cognate products continues. Thus while tank plate is selling for nearby delivery at fully 2.70c, No. 28 gauge sheets have sold as low as 3.10c and No. 20 gauge in proportion, or at 2.70c, the same price at which tank plate ¼ inch and heavier has sold. This is a previously unheard of anomaly. The nominal price for rails continues $30 to $32, while Bessemer steel billets have sold all the way from $36 to $40.

A most remarkable feature of the situation in the country at large is the fact that a district which has not purchased pig iron here or in the Valleys for 15 or 20 years has been forced in the past week to purchase a lot of Bessemer pig iron in this market.

PIG IRON.—The associated furnaces have just entirely withdrawn from the market on Bessemer pig iron, and will hold a meeting Saturday to determine the course as to selling for next year's delivery. Some moderate sized lots of iron have been sold in the past week for delivery this year, and there is now no iron which could be sold for this year's delivery, outside of the fact that furnaces have withdrawn from the market as stated. A considerable part of the iron just sold is to go to a district which has not for 15 or 20 years purchased iron in this market. A number of the furnaces will open the year with round lots of Bessemer still on their books which should have been made and delivered this year. It will be perhaps as late as March 1 before they are caught up. The question of steel works buying for their requirements this year is now a dead issue, as they will not receive this year even the iron contracted for before this. During the past week Bessemer has sold all the way from $21 to $21.50, Valley, both for this year's delivery and for next year. It is rumored that even higher prices have been paid for delivery in the next two months, and there is no question that several dollars a ton higher might be realized, if one had the iron ready to ship this month or even next. In foundry iron there is very little to be had for this year, and fancy prices, as high as $22

or $23, have been secured for early delivery, but the bulk of the movement has been in iron for next year's delivery, at from $20 to $20.50, and prices for this year's delivery are really of little import, on account of its being next to impossible to insure deliveries. In mill iron there is also a decided scarcity. We give the following quotations, it being understood that the figures on Bessemer are scarcely more than nominal, and that those on foundry iron are for late deliveries:

Bessemer, valley furnace	$21.00 to	21.50
Bessemer, Pittsburg	21.75 to	22.25
No. 1 Foundry	21.00 to	21.50
No. 2 Foundry	20.50 to	21.00
No. 3 Foundry	20.00 to	20.50
Gray Forge, valley furnace	17.50 to	18.00
Gray Forge, Pittsburg	18.00 to	18.25

STEEL.—Until now the scarcity of Bessemer pig among steel mills of the Central West has scarcely touched Pittsburg, but it is now affecting the leading producers, one of which has lost time twice through the impossibility of getting sufficient pig iron, while another is just on the ragged edge, and is likely to begin losing time almost any day. It may be added that when the producers referred to begin to lose time the indication is a very important one indeed. Operations at Valley and Wheeling mills have been more uncertain than ever, and production has been seriously interfered with. A feature of the situation which has not yet been noted, and which has prevailed for some weeks, is that in the effort to catch up, Bessemer furnaces generally have been forcing production more than they should, and the result has been too great a quantity of low silicon iron, the silicon being too largely removed on account of the modern heavy blowing capacity. This iron is perfectly permissible in the converter when mixed with the proper proportion of higher silicon iron, but the latter has not been turned out in sufficient quantity, and the result has been that steel mills in a number of cases have been forced to shut down, although having larger or smaller quantities of pig iron on hand, because it was too low in silicon and there was not sufficient higher silicon iron to use with it. It is quite possible, in view of this, that production of Bessemer pig this month may be reduced from the necessity of working furnaces more moderately in order to turn out iron that can be used. Some very fancy prices have been paid for both Bessemer and open-hearth steel in the past week, most of the selling having been done by middlemen, and the total reaching but a small quantity. As high as $40, at mill, has been paid for a small lot of Bessemer billets, and other sales have been made down to a minimum of $36, at which we quote the market. We quote open-hearth basic at $45, with only a small quantity to be had.

FERRO-MANGANESE.—Prices of ferro have greatly stiffened, and deliveries are difficult to secure. Some foreign ferro has been sold in this market at as high as $100, and this price is now quoted by the local producer for carload lots. It is doubtful if orders for large lots could be placed at all.

RAILS AND TRACK MATERIAL.—There is nothing doing in the rail market and it is doubtful if any good sized lots could be secured, although nominal quotations at Pittsburg continue at $30 for 100 tons and over, $31 for carloads and under 100 tons, and $32 for less than carloads. In track material there is the usual run of business, at the following prices: Spikes, 2.25c to 2.30c; track bolts, 2.65c to 2.75c; splice bars, 1.75c to 1.90c; links and pins, 2.15c to 2.25c.

BARS.—This market continues very strong. We quote steel bars at 2.10c to 2.25c, full half extras, and all muck iron bars 2.05c to 2.15c.

STRUCTURAL MATERIAL.—This market is quiet and there is nothing important in sight. It will be remembered that the great bulk of the business for the season was done at the considerably lower figures of earlier in the year. We quote prices unchanged as follows: Beams and channels, 3 to 15 inches, 2c; 18 to 24 inches, 2.10c; tees, 2.05c; zees, 2.05c; angles, 2c. Universal mill plates have advanced to 2.50c to 2.70c.

PLATES.—The plate market is still very firm. Selling for next year's delivery is impeded by reason of the fact that some mills cannot assure their position as to raw material, and await a clearing up in the pig iron situation. It is known that some local mills will be fully engaged on orders now on their books for several months in next year. As high as 2.55c has been done on tank for next year, but we quote the market at 2.50c. For delivery in the next two or three months there are only a few mills in position to quote, and a premium of about $4 a ton is readily secured. Some mills are refusing all business in plates thinner than ¼-inch and none will take orders for thinner than $\frac{5}{16}$-inch. The Carbon Steel Co. this week took an order from the government for 100 tons of 2-inch protective deck plate, to be used for repair purposes on vessels at the San Francisco yard. These plates are to be of high carbon and a high tensile strength is required, but they will be subjected to no special hardening process. We quote the market as follows for late deliveries: Tank, 2.50c; shell, 2.60c; flange, 2.75c; fire box, 3½ to 4c.

PIPES AND TUBES.—There is nothing new in the market. Mills cannot take on any new orders except for rather late delivery, for which business former prices prevail. The offices of the National Tube Co. are being fitted up in Pittsburg, but will not be ready for general occupancy before the middle or latter part of next week. The purchasing agent only has located in the offices. The local sales office of the National Tube Works Co. will probably be continued, for the same territory by the new company, the general selling offices being in connection with the company's general offices just referred to. We quote discounts as follows: Merchant pipe, base discount, 50 per cent and additional discounts two 10's for less than carloads and two 10's and 5 for carloads, with free delivery on the latter within the prescribed territory; lap weld casing, 40 for screw and socket joint and 35 for inserted joint, with 5 per cent additional on carload orders; boiler tubes, 1¼ to 1½ inch, 40 per cent; 1¾ to 2½-inch, 50 for iron and 55 for steel; 2¾ to 6-inch, 55 for iron and 57½ for steel; extra 5 per cent to dealers.

SHEETS.—The sheet market continues to rise slowly. The general condition is very strong and sheets, both black and galvanized, ought to sell for much higher figures. A very large tonnage of light plates has gone to sheet mills which were formerly rolled on the regular plate mills, which for some time have been refusing to take orders for anything lighter than $\frac{5}{16}$-inch while some place the minimum at ⅜-inch. The result has been a raising of market prices on heavy gauge sheets, at a considerably more rapid rate than that at which the lighter gauges have risen, so that light plates have in many instances sold at prices altogether out of proportion to the prices of the lighter gauges, and in some cases actually higher. For delivery within the next two or three months nothing better than 3.10c can be done for No. 28, and the proportion holds good down to about 20 gauge, making this gauge 2.70c, and this is the price at which tank plate for the same delivery has sold. The anomaly is certainly a very remarkable one. There are only a few mills quoting for nearby deliveries of sheets, and some quote considerably above 3.10c for No. 28. Mills and dealers who can make quick shipment are asking considerably higher figures, and as high as 3.40c and 3.50c is quoted for delivery within a month. In galvanized there have been some odd sales within a fortnight or so at 70 and 10 off, but the market is now recognized as being no lower than 70 and 5, with a 15-cent freight allowance. Predictions are made by well informed persons that 3.75c for No. 28 black, and 65 and 10 for galvanized, will be the prevailing market rates before the end of the year.

SPELTER.—The spelter market is rather dull. Prime Western grades may be had in the market at 5.90c.

OLD MATERIAL.—The market is not very active on account of the general scarcity, and prices are nominally unchanged as follows, Pittsburg, gross tons, except where otherwise specified: Heavy melting stock, $16 to $18; steel rails, mixed lengths, $17.50 to $18; iron rails, $22 to $22.50; cast borings, $9. net tons; cast scrap, $16 to $17; No. 1 wrought scrap, $17, net tons; busheling scrap, $13 to $14, net tons.

COKE.—Coke is very scarce and orders are difficult to place. It is doubtful if any furnace coke for nearby delivery, or in fact any delivery, could be had below $2.50 for strictly Connellsville, while foundry coke is very strong, and held at from $2.50 to $2.75.

CHICAGO.

Office of The Iron Trade Review and Industrial World.
1522 MONADNOCK BLOCK, Aug. 15.

Both for iron and steel products there is a decided premium for spot shipments over deliveries at the easy convenience of producers. Billets have been sold during the past week at from $2 to $3 higher than the quotations for remote shipment.

Bar iron is selling the same way. Pig iron likewise commands a fancy price for immediate use. And for plates and some structural shapes ready material is equally or still more a rarity, while rails in standard sections are out of the market. The scarcity of all these products seems to have been increased during the past week. Consumers are anxious and keep searching the market for the desired products. It is usually a vain quest and the conclusion is forced into general recognition that—to put it conservatively—there is no improvement in the impoverished condition of the market on its supply side. Prices are generally stationary, though the better grades of pig iron are higher and, as stated above, immediate deliveries command a widening premium.

PIG IRON.—Activity of an unmistakable character has again been the feature of the pig iron market. There have been a large number of transactions in small lots of from 400 to 1,000 tons, chiefly for deliveries running through the early months of 1900. The aggregate of business closed perhaps exceeds that of the previous week. It is intimated that one large seller may soon be out of the market for the early months of the coming year. Melters of iron are experiencing continued difficulty in procuring needed supplies and makers see no prospects that the conditions will change in the near future. From reports received here stocks of pig iron Aug. 1 were 153,000 tons, a decrease of 27,000 during July, while the estimated weekly production in July was 251,000 tons, a decrease of 3,500 tons as compared with June According to these figures consumption is still greater than production. The inquiry is especially urgent for the finer grades of iron and the market is distinctly stronger. Quotations as revised are as follows:

Lake Sup. Charcoal	$23 00@$25 00	Southern Coke No. 3	$18 65@$19 15
Local Coke Fdy. No. 1	20 50@ 21 00	Southern No. 1 Soft	20 15@ 20 40
Local Coke Fdy. No. 2	20 00@ 20 50	Southern No. 2 Soft	19 15@ 19 65
Local Coke Fdy. No. 3	19 50@ 20 00	Southern Silveries	22 00@ 24 00
Local Scotch Fdy. No. 1	20 50@ 21 00	Jackson Co. Silveries	28 00@ 29 00
Local Scotch Fdy. No. 2	20 00@ 20 50	Ohio Strong Softeners	23 00@ 24 00
Local Scotch Fdy. No. 3	19 50@ 20 00	Alabama Car Wheel	22 00@ 23 00
Southern Coke No. 1	20 15@ 20 40	Malleable Bessemer	22 50@ 23 00
Southern Coke No. 2	19 15@ 19 65	Coke Bessemer	23 50@ 24 00

BARS.—The greater scarcity is said to exist for the larger sizes of iron bars. The situation seems to be growing worse and large makers, who a week ago were taking contracts for November delivery, are now making the date December. Consumers of iron bars are specifying very freely and mills are not able to keep even with the demand. Steel bars are selling in steadily good-sized lots, and another of the Eastern producers has advanced prices $3 per ton to 2.40c, Chicago. Locally, however, steel bars can still be bought for about 2.05c. Iron bars are unchanged at 1.95c to 2c.

STRUCTURAL MATERIAL.—Transactions in structural material have been few and comparatively unimportant this week. Prices remain firm and material is moving freely on old orders. Quotations follow: Beams, 15 inches and under, 2.15c to 2.20c; 18 inches and over, 2.25c to 2 35c; angles under three inches and over six inches, 2.25c to 2.35c; three inches to six inches, 2.15c to 2.25c; sheared plates, 2.85c to 3c; universal plate, 2.75c; tees, 2.20c to 2.30c; zees, 2.20c to 2.30c; smalr lots from store are quoted from ¼c to ½c higher.

PLATES.—Nothing that is new has developed in the plate trade. Mills are daily turning down inquiries and are busying themselves only in making as rapidly as they can the plates fo which orders have been on their books for a long time. Prices follow: Tank steel from store, 3.10c to 3.30c. Mill shipments, Chicago delivery: Tank steel, 2.80c; shell, 2.90c; flange, 3c; marine, 3c: fire box, 3c to 5c, according to brand.

MERCHANT PIPE.—The pipe trade is without change, business being of moderate dimensions and prices unchanged. Quotations are 50 to 50 and 10 per cent.

SHEETS.—Buying is not large in this department of trade and prices are not yet quite settled, black sheets ranging from 3.10c to 3.20c. Galvanized sheets are moving more briskly with quotations at 70 from store and 70 and 5 to 70 and 10 from mill.

MERCHANT STEEL.—This is the dull season for the agricultural implement makers. The old season has ended and the new is beginning. All makers are buying in fairly good sized lots, and most of them have contracted for at least a portion of their next season's needs. Some consumers are buying a little more conservatively, however, until the requirements of the farmers for the new year become a little more clearly established. Prices are firm. Smooth finish tire steel is quoted 2.60c to 2.70c; smooth finish machinery steel, 2.80c to 2.85c; spring steel, 3.20c to 3 30c; tool steel, 6c to 7.50c; special, 10c and upwards.

BILLETS AND RODS.—Some Bessemer billets have been sold during the past week for prompt shipment at about $37. But for distant deliveries the market is several dollars lower. Trading is confined to small lots. Open-hearth billets are quoted all the way from $40 to $50, according to size and shipment wanted. Rods are nominally $45.

RAILS AND TRACK SUPPLIES.—Transactions are confined mainly to moderate lots of light sections, the prices of which are unchanged. Inquiries for standard sections meet with no encouragement from the mills. Standard sections are quoted at $31, and light rails $31 to $37. Splice bars are 1.70c to 1.85c; spikes, 2.40c to 2.50c; track bolts, 2.90c to 3.25c.

OLD MATERIAL.—Prices are more or less irregular. The tone of the market is clearly strong and quotations widely at variance are heard. Material is scarce and needy buyers do not hesitate. A conservative estimate of the somewhat uncertain values is as follows:

Old iron rails, gross	$20 00@$20 50	Axles, net	$19 00@$20 00
Old steel rails, long, gr.	15 00@ 15 50	Cast borings, net	6 50@ 7 00
Old steel rails, mixed	14 50@ 15 00	Wrought turnings, net	7 50@ 8 00
Old wheels, gross	15 50@ 16 00	Axle turnings, net	8 50@ 9 00
Railroad forge, net	15 50@ 16 50	Mixed steel, gross	11 50@12 00
Dealer's forge, net	12 00@ 12 50	Stove plates, net	7 50@ 8 00
No. 1 mill, net	9 00@ 9 25	Heavy melting steel, gr	13 50@14 50
Heavy cast, net	13 00@ 13 50	Old iron splice b., net	16 50@17 50
Malleable cast, net	10 00@ 11 00		

WIRE AND WIRE NAILS.—Values remain unchanged and trade is of a fairly good volume. Nails are, perhaps, the best selling of the products. Makers quote single car loads of wire nails at $2.80 f. o. b. Chicago, and $2.90 less than car loads. On wire current quotations are as follows: Plain annealed wire, $2.65; painted barb wire, $2.90; galvanized barb wire, $3.40.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World*, 27 VINCENT ST., Aug. 16.

Whatever may prove to be the fact as to the proportion of ore stockpiles at Lake Superior mines moved in the first three months of navigation, there appears to have been no slackening in the first half of August from the July pace of ore shipments. This week there is a bunching of vessels at lower lake ports and some delay has resulted, but this is only temporary. The demand of ore-unloaders at Lake Erie docks for 2½ cents a ton advance has been settled at 1½ cent, making the rate now 12½ cents and no discrimination is to be made against untrimmed ore. Shippers are not acting as though they believed that the falling off in stockpile shipments in September and later August will be greatly felt when the grain movement of September begins. Not only are they bidding for boats and taking them, in competition with grain men, but they are just now putting up rates on each other, getting them in some cases above the grain equivalent. One interest in particular has been an active competitor with grain shippers for wild tonnage. The advance in the week on Duluth ore charters is 15c, $1.25 having been paid this week. From Marquette, business has been done at $1.10 and from Escanaba at 90c to Ohio ports and $1 to Buffalo. The situation is a very strong one, and even though the 10,000,000-ton mark in ore shipments should be passed by Sept. 1—and the total may go 200,000 to 300,000 tons beyond that point, the coal and grain situations are such as to indicate a vesselmen's market to the end. Furnacemen seem disposed to take no risks on their ore. In case of shortage, ore on Lake Erie docks would be pro-rated among the buyers of each ore short. Meantime furnaces are taking every pound possible into furnace yards and giving orders that none go on docks. Some delays in unloading result, as cars must be at vessel side for direct shipment of entire cargoes.

PIG IRON.—Buying of foundry iron for shipment in 1900 has continued active in the past week. One contract has been closed in this market for 6,000 tons of Northern No. 2 foundry, deliveries from January to December, 1900. For the most part current sales are for delivery in the first half of next year and prices range from $20 to $21 at furnace for No. 2 iron. Foundrymen appear more urgent about shipments of iron on contracts, and telegrams and telephone messages telling of impending shut downs that can only be averted by hurrying up iron are a regular feature; yet few actual stop-

pages take place. Occasional inquiries for iron for early shipment come up and the market is scoured for odd lots As sellers become more and more filled up for 1900 prices are advanced. Some large buyers have as yet done little or nothing about next year's iron, but the number is lessening each week. In forge iron, there is a very firm market at $17.50 to $18, valley furnace. A sale of off-basic is reported at $19. In Bessemer little is being done with valley furnaces. Iron can be had at $21, furnace, for delivery in the first half of 1900. We quote f. o. b. Cleveland:

Bessemer	$21 75	Valley Scotch No. 1	$20 75@21 75
No. 1 Strong Foundry	20 75@ 21 75	Valley Scotch No. 2	20 25@21 75
No. 2 Strong Foundry	20 25@ 21 25	Gray Forge, valley	17 50@18 00
No. 3 Foundry	18 75@ 19 25	Lake Superior Charcoal	22 00@23 00

FINISHED MATERIAL.—The market of the week has repeated that of the midsummer weeks in its incidents of urgent inquiries for prompt material, and of premiums paid on small-lot shipments for early delivery. The plate market promises little relief until 1900 is well under way. In the case of one large producer business now booked will last into the middle of next year. Prices on current business range from 2.60c, Cleveland, upward, on delivery this year. Perhaps the best deliveries in all the lines of rolled products are on sheets. Shipments can be had in from one to two months. On heavier sheets higher prices are made than on some of the lighter gauges. For example No. 16 out of stock sells at 3.35c, Cleveland, which is also the price for No. 28, intermediate gauges being at lower prices—18 to 20 at 3.15c and No. 27 at 3.30c from stock. Rolling mills are getting farther filled up on bar iron and December delivery is now earliest on large lots, as against November delivery two weeks ago. While 1.85c at valley mill is the quotation, this is on large lots calling for few sizes. For cutting to length $1 a ton extra is charged and where a carload contains more than three sizes $2 extra, so that 2c valley is really the price on a considerable amount of going tonnage. Steel bars are higher. One Western Pennsylvania maker has advanced the minimum quotation to 2.25c at mill. Shipment this year on new contracts is difficult to obtain. Some business has been done locally in beams and channels the past week. With some important producers structural steel is the only line of material on which new business can be taken for 1899, and very little at that. As yet the buying for 1900 in this market is not extensive. The implement manufacturers have been feeling the market but have committed themselves to only a limited tonnage thus far.

OLD MATERIAL.—With little change in the tone of the market apart from a rather firmer holding of prices in a few lines, we quote: Old iron rails, $20.50 to $21; old steel rails, $16 to $16.50; old car wheels, $17, gross tons. No. 1 railroad wrought scrap is $17.25 to $17.50 valley mill; iron axles, $20; axle turnings, $11; wrought turnings, $10 to $10.50, mill scrap, $13; machine cast scrap, $13 50 to $14.

WIRE AND WIRE NAILS.—Demand is well maintained for the season. In wire there is little accumulation at the mills, and the nail mills are running more generally than is usual in August. We quote wire nails, Pittsburg basis, as follows: To jobbers in carload lots, $2.50; to retailers in carload lots, $2.65. Smooth wire remains at $2.35, Pittsburg, in carload lots to jobbers; painted barb wire, $2 60; galvanized, $3.10.

CINCINNATI.

Aug. 15.

Rogers, Brown & Co. say: "The past week has been one of marked activity and the prospect is favorable for the continuance of a heavy demand. Contracts placed cover the entire range of foundry, forge and basic iron and in some cases deliveries run through the whole year of 1900. In Southern irons there is no change in quotations, but there is great firmness. In Northern irons prices have generally been advanced $1 per ton and the inclination seems to be to put them still higher. Although the estimated output of furnaces for July was quite largely increased, we still think that the production for the entire year will not exceed the estimate made by us in April. Our information at that time indicated that production would not be more than 10 per cent greater than last year, making the entire product somewhat less than 13,000,000 tons. Those well informed in relation to Lake Superior ores entertain great fears that it will be impossible to fill the orders that have been booked, and this will undoubtedly be true unless navigation is more than usually prolonged. The difficulties attending the starting of more stacks in the South are well known, and the situation now hinges on the Lake Superior ore supply. The advance in Bessemer irons and probable shortage will naturally cause an increase in price of coke malleable. We quote for cash f. o. b Cincinnati: Southern coke, No 1 foundry, $19.25 to $19 50; No. 2, $18.25; No. 3, $17.50 to $17.75; No. 4 and gray forge, $16 75 to $17; mottled, $16.75 to $17; No. 1 soft, $19 25 to $19.50; No. 2, soft, $18.25; Lake Superior coke, No. 1, $21 to $21.50; No. 2, $20.50 to $21; Hanging Rock charcoal, No. 1, $21 to $22; Jackson Co. silvery, No. 1, $27; Standard Georgia car wheel, $19.25 to $20.25; Lake Superior charcoal, $24."

PERSONAL.

W. J. Rainey, the well-known coke operator, has gone on a trip to Europe.

John D. Paton, superintendent of the Crescent mill of the American Tin Plate Co., Cleveland, was given a gold watch and chain by the employes on Saturday.

Henry W. Hartman, president of the Hartman Mfg. Co., of Ellwood City, Pa., has sailed for Europe.

E. H. Putnam, for the past year connected with the *Foundry* as associate editor, has accepted the position of superintendent of foundries with the Moline Plow Co., Moline, Ill.

Capt. G. C. Conner has been appointed general manager of the Chattanooga Furnace Co., Chattanooga, Tenn.

Armin Schotte, C. E., of Pittsburg, has been appointed consulting engineer for the new works of the Auto-Car Co., of Pittsburg.

Robert Ramsay, consulting engineer of the H. C. Frick Coke Co. and superintendent of the company's Standard Coke Works, the largest coking plant in the world, died at East Kill Bride, Scotland, on Monday, at the age of 58. The remains will be brought to this country for interment. Mr. Ramsay started to travel abroad last May for his health, but became too weak for travel and was compelled to remain in Scotland. He was born in Dunfermline, Mr. Carnegie's birthplace, but early came to the United States, where he became a coal digger, studying mining, civil and mechanical engineering in spare moments. He was made superintendent of the Monastery Coke Works of Carnegie Bros. & Co., Ltd., and when the plant was turned into the H. C. Frick Coke Co. was made superintendent of the Standard plant, which he built up to its present efficiency. Mr. Ramsay lived at Mt Pleasant. He had eleven children, one of whom, Erskine, is general manager of the mines and coke works of the Tennessee Coal, Iron & Railroad Co. Mr. Ramsay was known as one of the leading mining engineers of the country.

IT is reported that the mine in part underlying the old townsite of Eveleth, Minn., the purchase of which was recently negotiated by John T. Jones and P. L. Kimberly, has been acquired by the American Steel & Wire Co. The deposit extends to the old Vega or Cloquet mine. The bonus stipulated is reported to be $75,000, and the royalty 30 cents, based on a minimum of 200,000 tons. The sinking of a shaft will begin at once.

H. W. OLIVER has purchased a tract of land on the Monongahela River at Rankin, a short distance above Pittsburg, having 400 feet frontage on the river and being about 235 feet deep. It is located between the properties of the Braddock Brewing Co. and the Garland Chain Co It is stated that it will be used for the erection of a chain-making plant.

THE R. D. Nuttall Co., Allegheny City, Pa., finished this week an unusually large cut gear. It is a plain spur gear, 12 feet in diameter and 15 inches face, the pitch being 4 inches. The gear is cast of steel, in halves, with eight spokes. It was finished on the large gear cutting machine, which is able to take a gear 15 feet in diameter and about 25 inches face. The weight of the gear was about 10 tons

ROGERS, BROWN & Co. announce their appointment as Western sales agents of the Virginia Iron, Coal & Coke Co. and will handle the output of the Carnegie, Embreville, Watts and Bristol furnaces. They will also sell the output of the Vanderbilt furnace.

UNION MOLDERS AND MOLDING MACHINES.

Piece work was the problem that brought out long and earnest discussion at the convention of the International Association of Machinists at Buffalo in May; and, as the report recently presented in our columns indicated, the system was recognized as one from which the union had much to fear. The question seemed to have narrowed down to a square issue against piece work, with defeat inevitable, or the alternative of accepting it and gaining some modifications and restrictions.

The corresponding problem of union iron molders, as it developed at the recent Indianapolis convention of the Iron Molders' Union of North America, is the molding machine. The attitude of union molders toward all forms of machines for molding, from the original squeezer type to the stripping plate machine and latter day squeezer, has been well known. Persistent opposition from molders has given machine molding over to laborers who had not learned the molder's trade. And as the organized molders have insisted from the beginning that the molding machine was a failure and could never become adaptable to lines of work in which it has been gradually achieving success, the machine has been left to itself by the unions. As a foregone failure it needed no action by the union, and the policy has been to ignore its existence, and allow non-union laborers to go on working out their own and the machine's destruction! Thus let alone the machine has been making headway Inventive geniuses, in spite of the attitude of workmen and the skepticism of proprietors, have been working early and late to develop machine molding and extend its field from small castings, of which large numbers were to be made of one pattern, to larger and more intricate work calling for the stripping plate type. The success of these efforts has been cumulative. In the years of depression, with molders plenty and wages at a minimum, the headway made by the machine was chiefly with large concerns in lines adaptable to machine operations, who saw the ultimate economies of the machine and were not daunted by the initial expense. As times improved, labor cost advanced and skilled labor became scarcer, the molding machine manufacturers were able to get a better hearing, and in the past two years have made good progress.

The molders' union, convinced at length of its mistake, came out flatly at its Indianapolis convention and said so. It found the machine a serious menace to the efforts of the union to maintain a high wage basis for skilled labor. President Fox, in his address on the subject, told the Indianapolis convention that union control of the molding machines was necessary or the machines would control them. He said that while in some branches of the trade the introduction of machines would not be a paying investment, "in others they are a problem which must be met speedily and intelligently," and added: "I feel that this convention will agree that this is the case, and that the policy of detraction and opposition must be forever abandoned. It is a truth that all history can be brought to prove, that if a labor-saving machine have merit, no opposition that the laborer can bring to bear will prevent its introduction. I strongly advise, then, that our members agree to work on those machines and bring out their best possibilities, providing satisfactory arrangements can be made as to wages. The mistake was made at the beginning, when our members refused to work on them, but we should be guided by our experience, and without further delay adopt such a policy as will give to our members the control of the machine and retain to them the trade which they have spent the best years of their lives in acquiring."

The convention unanimously adopted the report of the committee on the subject, as embodied in three resolutions, the third of which directs the officers of the union to bring the matter before the various foundrymen or foundrymen's associations with a view to securing their co-operation. The other two are as follows:

"First, that it be accepted as the future policy of the Iron Molders' Union of North America that we shall seek to establish our jurisdiction over the molding-machine operator and all those who work at molding in the numerous subdivisions into which the specialization of our trade has divided it.

"Second, that we advise and instruct our members to accept jobs upon any molding machine when the opportunity is afforded and to endeavor to bring out its best possibilities."

In commenting upon this action of the convention the *Iron Molders' Journal* thus presents the matter to the consideration of the element in the union that has been opposing the machine:

"Many of us seem to be imbued with a false pride regarding our reputations as mechanics. Thus we have heard within the past few weeks of some of our members quitting a shop rather than go to work upon a 'squeezer.' And yet the machine in the case did nothing more than do away with the hand ramming; otherwise the skill of the mechanic was just as essential as ever it was to good work What will result from such obtuseness? Just what has resulted time and again under our very eyes—the employer will not go to the molder when he wants an operator, but will go to some bright, active young laborer, give him a small inducement to operate the machine, and in a very short time the molder will not get a chance to operate it and it will run him out of the foundry."

But the action at Indianapolis does not settle the question. It may be only the beginning of turmoil over the machine. The union now seeks to control it. In a Western foundry within the past 10 days a strike was made in which one of the two demands of the men was the control of the molding machines; that is, machine operators must be union men. But at what price? The pay for machine operation has been pretty well gauged, in some shops laborers who have never acquired the molder's trade doing the work satisfactorily. If it is now sought to establish a higher standard of pay for machine work, and deprive foundry companies in part of the advantages gained by large investments of money, it may be expected that the latter will make vigorous protest. Co-operation by foundrymen in the action taken at Indianapolis will depend entirely upon the reasonableness of the molders' position. They should not make the Homestead mistake of 1892, in insisting on high piece rates after the company, at heavy outlay, has provided them with the machinery for largely multiplying the production of their hands. It is a question, indeed, whether proprietors who have established their machines in spite of the opposition of the union, will now take kindly to handing these over to the union's supervision on any basis.

Pittsburg Blowing Engines.

Referring to the contract taken by the Mesta Machine Co., of Pittsburg, for five pairs of cross compound blowing engines for the Illinois Steel Co., the engines to be built at the new Mesta Machine Co. plant now building at Homestead, *Tin and Terne* says: "It will be remembered that only a few months ago Andrew Carnegie, in a public address, stated regretfully that when Pittsburg manufacturers required blowing engines, they had to go to Milwaukee for them. He hoped that the time would come when such engines would be made in the Pittsburg district. In another column we note the fact that a Pittsburg concern has just taken an order for five pairs of blowing engines of the largest size, weighing about 400 tons to the pair, and having 4,500 horse power. It is interesting to note that these engines are to go to Chicago, which is not so very far from Milwaukee, and that they will be manufactured in a plant now being built adjoining Mr. Carnegie's own works at Homestead."

THE *Railroad Gazette* prints the following list of orders for new equipment: Michigan Central has received bids on 5,000 freight cars. Atchison will build at its own shops 600 box cars. Erie has placed an order with the Pressed Steel Car Co. for 1,000 steel cars. It is reported that Chicago & Northwestern has ordered 2 500 freight cars from the Haskel & Barber Co. Indiana, Illinois & Iowa has ordered from American Car & Foundry Co. 400 coal cars of 80,000 lbs. capacity, and 8 caboose and 5 passenger cars. The road will also place an order for 100 box cars of 80,000 lbs. capacity. Wheeling & Lake Erie will buy 10 locomotives. It is reported that Burlington will order some new engines. Pennsylvania has ordered 34 locomotives to be built at its Altoona shops. St. Paul will build 6 switch engines at its West Milwaukee shops. It is said that Chicago & Eastern Illinois will contract for new locomotives. Queen & Crescent has placed an order with the Pittsburg Locomotive Works for 8 consolidation engines. Erie has ordered 25 consolidation engines from the Rogers Locomotive Co., and will probably increase the order to 30.

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AND
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AUGUST 17, 1899.

COSTS FOR LARGE AND SMALL PRODUCERS.

Our correspondent "Scrutator," writing in another column of a consolidation's cost of production as compared with that of a smaller concern making the same product, assumes that the large corporation, with a "watered" capitalization has necessarily the higher cost. No generalization on this point would be accurate. Much has been assumed in what has been written concerning the industrial consilidations formed in the past six months; and the weaknesses of the whole family of consolidations have been brought out in detail, and with a thoroughness suggesting that the new corporations had been for years under observation. But what is true of one is not necessarily true of another. There are consolidations whose economies exist largely on paper, and whose interest account is cumulative dividends on preferred stock constitute a heavy handicap in the race with a small company economically managed and able to command raw materials on substantially even terms. But this is not the condition of all or, we venture to say, of any considerable proportion of the newly formed corporations. Real economies have been secured by merging a dozen or a score of sets of fixed charges; by making one buyer out of a dozen or twenty who formerly competed for raw materials; by saving the freights of cross shipments, and serving the consumer from the nearest factory; by reducing to a fraction of the former aggregate the expense of selling. There is no divisor for fixed charges like large tonnage, for rapid reduction of the unit of cost; and the lower cost of a concern putting out, say, 1,000 tons a day, as compared with one producing 25 tons is familiar enough in the iron industry. As for the watered stock of the big corporation, that has no essential connection with cost. The capitalization does not begin to be a factor until there are profits to divide. Capitalization is a matter of earning power, in short; and the determining factor is not so much what the plants cost, as what the plants can earn. And the new earning power resulting from the new status, by which economies are secured and the unit of cost reduced as the output increases, makes perfectly legitimate a new capitalization that departs from the metes and bounds of the traditional inventory. In addition to the catalogue of economies that are familiar from oft-repetition in consolidation prospectuses, there is that which results from control of sources of raw material supply. This in the case of certain large iron and steel companies, for example, is vastly valuable. It would be difficult to overestimate, for example, the value of a supply of Connellsville coal equal to the demands of 50 years' operation, in view of the fact that such supply is absolutely unobtainable to-day to a steel company that should now be organized to compete with existing companies. The same point may be made respecting ore supply. These semi-monopolies rightly figure in fixing the capitalization of such companies, and are no more "water" than would be the equally immaterial and intangible good-will of a business 50 years in existence.

One or two years under the new regime may give a new set of facts from which some generalizations can be made; but meantime it will be wisdom to make an estimate on each individual set of facts.

"SCRUTATOR" ON THE COMBINES.

TO THE EDITOR:

It has been pretty well decided in their own minds by students of such things, that a trust, to be successful in the long run, must do the mass of the people a service, instead of trying to squeeze them, and the Standard Oil Co. is always used as the example of the trust that has done the service and achieved the success. As about everything has lately been put into trust form, the question is more than ever interesting, and the query is: How long will all these trusts last?

It is pretty safe to say that those that do the community a service by lowering prices will last indefinitely, and those that do not do the community a service of this sort, will occupy the position that Mr. Gilderoy's kite is supposed to have occupied.

It is also pretty safe to assume that a trust with watered capital will simply not be able to give the people low prices, and therefore cannot live. Certainly no trust with watered capital can produce goods as cheaply as an outsider without watered capital; and looking at it either way the watered trust is doomed. If it sells too low it will fail, and if it does not sell low, it will not sell at all.

Further, there is, either rightly or wrongly, much feeling against trusts as such. So that even at the same price, the average purchaser will select the article not made by a trust. We now see everywhere notices: "These Goods Not Made by a Trust" This feeling, or prejudice, or whatever it is, will not of itself injure the trusts in the long run, provided other conditions are all right.

This theory seems to be borne out pretty well in practice, and there is a particularly strong example of it in my own experience. The machine shop with which I have the pleasure and honor, etc, to be connected, makes among many other things, machinery and tools for a certain industry which for the past five or six years has been in a very languishing condition, to put it mildly, and in consequence we had not sold any of the factories in this line any machinery or tools for several years. About six months ago these manufacturers got together and formed a trust. We immediately began to sell machinery and tools, *not* to those in "the trust," but to those outside of it; and the present condition of affairs is that all the outsiders are busy and the insiders are dull. And as the stock of the trust is watered I am not buying any real estate with the expectation of paying for it out of the profits of anything to be sold to the trust.

Before this I had formed theories of different things, and the subsequent facts seemed to prove that I didn't know much about the case; so I haven't said much about them. But in this case my theory seems so well backed up that I feel like saying, "I told you so," and do not hesitate now to put myself on record on this particular subject. SCRUTATOR.

CONVENTION OF ENGINEERS OF TESTS.

The second annual meeting of the American Section of the International Association for Testing Materials began its sessions in the rooms of the Engineers' Society of Western Pennsylvania, 410 Penn ave., Pittsburg, at 10.30 o'clock Tuesday morning. The chairman of the American Section, Prof. Mansfield Merriman, of South Bethlehem, Pa., presided. Richard L. Humphrey, of Philadelphia, is secretary. Among the names appearing on the register are the following:

James Christie, M. E., chief mechanical engineer Pencoyd Iron Works, Pencoyd, Pa.

P. E. Carhart, inspecting and testing engineer, Illinois Steel Co., Chicago.

Edgar Marburg, C. E., professor of civil engineering, University of Pennsylvania.

Charles L. Huston, vice-president Lukens Iron & Steel Co., Coatesville, Pa.

James M. Porter, C. E., professor of civil engineering, Lafayette College, Easton, Pa.

William K. Hatt, M. E., associate professor applied mechanics, Purdue University, Lafayette, Ind.

Gus C. Henning, M. E., consulting engineer, New York City.

Dr. R. G. G. Moldenke, Pennsylvania Malleable Iron Co., Pittsburg.

Herbert A. Schaffer, chemist Vulcanite Portland Co., Phillipsburg, N. J.

Paul Kreuzpointner, M. E., testing department Pennsylvania Railroad, Altoona, Pa.

Yaunsel White, engineer of tests, Bethlehem Steel Co., South Bethlehem, Pa.

H. F. J. Porter, Bethlehem Steel Co., South Bethlehem, Pa.

Wm. R. Webster, C. E., Philadelphia, Pa.

Mansfield Merriman, C. E., professor of civil engineering, Lehigh University, South Bethlehem, Pa.

Richard L. Humphrey, C. E., engineer in charge of testing laboratory, City Hall, Philadelphia, Pa.

Max H. Wickhorst, engineer of tests, C. B. & Q. R. R., Aurora, Ill.

Mr. McLeod, Carnegie Steel Co., Ltd., Pittsburg.

Arthur N. Talbot, C. E., professor municipal and sanitary engineering, University of Ill., Urbana, Ill.

Philip A. Lange, superintendent Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

B. E. V. Luty, Pittsburg, *The Iron Trade Review*, Cleveland.

J. A. Kinkead, engineer of tests, Chicago & Northwestern Railroad, Chicago.

Francis S. Rice, assistant engineer Keystone Bridge Works, Pittsburg.

A. Schotte, consulting engineer, Pittsburg.

George E. Thackeray, Cambria Steel Co., Johnstown, Pa.

Frank C. Osborn, the Osborn Co., Cleveland, O.

Tuesday morning's session was given up in part to reports of officers of the American Section and of the International Council. A paper by Prof. W. K. Hatt, entitled "Comparison of Steel Plates under Flexure and Tension," was read and elicited considerable discussion. In the afternoon the delegates visited the furnaces, steel works and laboratories at the Edgar Thomson plants of the Carnegie Steel Co., Ltd. An informal dinner was given in the ordinary of the Monongahela House Tuesday evening. Impromptu remarks were made by various members and by representatives of several Pittsburg manufacturing companies.

At 8.30 P. M. a second formal session was held, at which the address of Chairman Merriman on "The Work of the International Association for Testing Materials" was presented as given elsewhere. Wm. R. Webster, of Philadelphia, gave a preliminary report of the American members of the International Council on "Standard Specifications for Testing Iron and Steel." It contained an account of the organization of the sub-committee, and its division into sections, to each of which was assigned the collection and study of a particular group of specifications. The progress thus far made was described, with an outline of the plan for future work.

At 10.30 P. M. a reception was given the delegates and guests by the Engineers' Society of Western Pennsylvania.

Wednesday's morning session was devoted to preliminary reports on the iron and steel, and the cement, stone and paints groups by American members of the International Council. The preliminary report on "Impact Tests" presented by the chairman of Committee A., Prof. W. K. Hatt, gave a digest of present information on the subject, together with the answers to a circular sent by the committee to offices of railroads, manufacturers' plants and engineering colleges. These replies show that impact tests are practically limited to rails, axles, couplers and car wheels, but they indicate an unexpected uniformity of practice. The paper was followed by action on unfinished business and this concluded the meeting.

Wednesday afternoon was given to inspection visits to the works of the Westinghouse Electric & Mfg. Co., the Pittsburg Testing Laboratory and other establishments.

In addition to the officers named above, Prof. Henry M. Howe is vice-chairman of the American Section; Paul Kreuzpointner, treasurer; Gus C. Henning, international councillor, and Prof. Howe and Dr. Richard Moldenke, international advisory councillors.

NATIONAL FOUNDERS' ASSOCIATION.

The semi-annual meeting of the National Founders' Association was held at the International Hotel, Niagara Falls, Aug. 9 and 10, and was well attended. A number of questions involving important foundry interests were discussed, some of these coming up through a communication from the Iron Molders' Union. At the Cleveland conference in June between committees of the foundrymen's and molders' organizations, the representatives of the latter asked that the foundrymen declare in favor of a minimum wage. It was argued by the molders that to standardize wages, there must be a fixed starting point, and it was urged that an expression from the National Founders' Association would go far toward its establishment. No agreement was reached in the Cleveland conference, and the question was gone over thoroughly at the Niagara Falls meeting. Another matter that came up was the action of the Iron Molders' Union at the Indianapolis convention, on molding machines. A communication came from the molders, citing their action and announcing their policy of seeking hereafter to control molding machines and their operators. The piece-price system, which the molders in many cases have opposed, was also brought up. All these questions were referred finally to a special committee whose members will soon meet representatives of the Iron Molders' Union and determine if possible the best solution of these three important matters. A very general sentiment pervaded the deliberations of last week, that arbitration and amicable adjustments are much more desirable methods of handling these issues than the heroic measures involved in strikes and lock-outs.

The reserve fund of the association, which has now reached a considerable amount, was a subject of discussion, and various banks were designated as depositories.

The social features of the meeting were particularly enjoyable. President O. P. Letchworth and Mrs. Letchworth gave a reception at the International Hotel, Wednesday evening, to the members and the ladies who accompanied them, and the function was notably successful.

Niles-Bement-Pond Co.

Reference has been made heretofore to the consolidation of the Niles Tool Works Co., of Hamilton, O.; the Pond Machine Tool Co., Plainfield, N. J., and Bement, Miles & Co., all manufacturers of the heaviest machine tools, and the Philadelphia Engineering Works. The capital is $8,000,000, and the corporate name, Niles-Bement-Pond Co. The election of officers held at Jersey City, N. J., Aug. 15, resulted in the choice of the following: President, R. C. McKinney, of Hamilton; first vice-president, James K. Cullen; second vice-president, A. C. Stebbins; third vice-president, Walter L. Clark, all of Plainfield, N. J.; treasurer, Charles L. Cornell, of Hamilton; secretary, E. N. C. Davis. The board of director is composed of the following: Robert C. McKinney, Hamilton; Thomas T. Gaff, Gordon Shillito, Daniel H. Holmes, Cincinnati; C. A. Moore, of Manning, Maxwell & Moore; Fred. W. Gordon, of the Philadelphia Engineering Works; Col. Alex. Gordon, president Niles Tool Works Co.; Clarence A. Bement and Fred. B. Miles, of Bement, Miles & Co.; A. C. Stebbins, George T. Reiss, James K. Cullen and Walter L. Clark, Pond Machine Tool Co.; Col. Clarence E. Burke, of Cleveland, and W. S. McKinney, of Pittsburg.

THE MARKET FOR IRON AND STEEL STOCKS.

Denison, Prior & Co., of Cleveland, in their weekly iron and steel letter, say: "At last the mystery has departed from one of the New Jersey corporations. The American Steel & Wire Co. has filed with the listing committee of the New York Stock Exchange a complete statement of its business. Our New York correspondent wired us on Monday the following figures from their statement: Assets—Plant, $75,440,614.73; outside real estate, $6,019.65; stock investments, $5,348,242.09; cash on hand, $1,435,902.42; bills receivable, $253,189.28; accounts receivable, $7,229,281.04; inventory, $7,587,445.64; furniture and fixtures, $55,000; making the total list of assets equal $97,355,694.85. Liabilities—Capital stock, $90,000,000; bonds and mortgages, of which the holders refused a tender of payment, $130,656.25; accounts payable, which have been liquidated since the statement was made out, $3,302,990.15; profits of the organization less the first dividend on the preferred stock, $4,192,048.45; making a total apart from capital stock of $7,355,694.85. This statement is certainly sufficiently optimistic to be of immense benefit to the stock of the American Steel & Wire Co. and to all of the other iron and steel stocks as well. It should certainly help the preferred issue of the American Steel & Wire Co., and it is natural to suppose that this company can be taken as a criterion for the other iron and steel combinations, as there is every reason to believe that they can make statements of proportionate earnings. If a statement of this character had been submitted in the active market of January the high prices reached by the iron and steel issues at that time would have been insignificant compared with what would have followed such a publication.

"Great Britain has gone through an experience with industrials somewhat similar to that which this country is now having. At one time, as is now the case here, the railroad issues were the prime investment favorites. They sell at higher prices than industrials paying similar dividends. To-day in Great Britain the industrial and the railroad issues stand upon exactly the same basis and sell at prices proportionate to the returns upon the investment. In this country a 5 per cent railroad stock sells many points above par, while a 7 per cent industrial sells very close to par, and in many cases a number of points under that figure. We believe that if the iron and steel combinations can continue to make 50 per cent of their present earnings there is no reason why their preferred issues should not gradually gain the confidence of the conservative investor and sell on a proportionate basis with railroad securities paying an equal dividend.

"Publicity, however, such as that given by the American Steel & Wire Co., is one of the requisites to a higher level of prices for these preferred issues. The mysterious corporation may have its followers for a time, but the corporation whose earning capacity is known to its stockholders is bound to sell on a scale proportionate to the money returned on the investment."

Fluctuations in Iron and Steel Stock.

During the past week the iron and steel stocks have been leaders in the market and many new records were made, as shown in the table below:

Name.	WEEK.				YEAR.			
	Open	High	Low	Close	High.		Low.	
Am. Car & Fdy	18	18½	17	18	21⅞	May 25	15	June 15
Am. Car & Fdy pr	66	68	65	68	68¼	Aug. 1	56⅜	June 16
Am. Steel & Wire,.	57⅞	62½	57⅞	61⅜	72	May 4	45	Feb. 8
AmSteel & Wire pr	97¼	101	97¾	99⅞	106¾	Mar. 13	92⅜	Feb. 8
Am. Steel Hoop.....	34⅛	39¼	34⅛	39½	41⅜	May 3	24	May 24
Am. Steel Hoop pr	79⅜	84¾	79½	84¼	84¾	Aug. 14	70	May 13
Am. Tin Plate,.....	42	43	41	43	52⅜	April 4	33	May 24
Am. Tin Plate pr..	87½	91	87	91	99⅜	Feb. 8	81	June 1
Federal Steel.....	59¼	61⅛	59	61	75	April 3	46⅜	Feb. 8
Federal Steel pr....	81¼	83	81	83	93⅛	April 3	72½	May 13
National Steel.....	54	57	53¾	57	63	April 24	43¾	June 2
National Steel pr..	98⅝	99⅜	98¼	98⅝	99⅜	Aug. 11	85	May 15
Pressed Steel Car..	58	61	57	60⅛	61	Aug. 14	44¾	June 1
PressedSteelCar pr	88¼	90	88¼	90	90	April 13	78	May 25
Penn. Coal & Iron	79	92¾	77¼	89¾	92¾	Aug. 14	36	June 14

Republic Steel,	Monday's curb quotations	.....	23¼@23½
Republic Steel pref.	" " "	.....	73½@74
International Pump.	" " "	.....	25 @26
International Pump, pr	" " "	.....	73¼@74

THE New Doty Mfg. Co., Janesville, Wis., is operating its plant to its fullest capacity and there is no probability that it will be able to catch up with orders for some time.

LAKE SUPERIOR IRON MINES.

The recent deal by which the Lake Superior Consolidated Iron Mines secured new property in the Hibbing district, Mesabi range, was one of the most important of the year in Mesabi iron lands. The Consolidated company acquires the fee to 80 acres in Section 22, 58-20, about four miles northeast of Hibbing, estimated to contain at least 8,000,000 tons of ore. It also effects a consolidation of the leases of the Sellers and Hull and Townsite of Hibbing mines. The royalty of the Hull mine has been reduced five cents a ton and the consolidated lease runs for 50 years on a basis of a minimum annual output of 300,000 tons and a royalty of 25 cents, except the one-sixth interest held by certain heirs, which under the law can run but 25 years.

It is estimated that 19,000 men are now employed in Lake Superior iron mines, as compared with but 10,000 in 1894, when relief committees were looking after hundreds of destitute in mining towns, and 14,000 in 1892.

The American Steel & Wire Co.'s iron mining interests are to be operated under the name of the American Mining Co.

Water has been very troublesome on the Mesabi this year. Elba mine had so much difficulty as to interfere seriously with shipments, and the mine has ordered more pumps. Fayal has been unfortunate, and at the Carnegie property, Mountain Iron, the shovels have gone so deep as to make the sinking of a sump and placing of a pump a necessity. The heavy rains of the season have been hard on open pit mines especially.

The Ashland mine is hoisting 300 tons a day from No. 7 shaft. Two large Prescott stationary pumps are at work raising water from the drowned out workings of the mine and it is expected that the unwatering will proceed at the rate of 2,500,000 gallons every 24 hours.

Efforts are being made to organize Lake Superior iron miners. A preliminary meeting has been held at Ironwood, and agents are at work on all three of the Michigan ranges. The Oliver Iron Mining Co. has announced to its employes at Ironwood its disapproval of the proposed unionizing of its mines on the Gogebic range.

A find of ore of considerable proportions is reported between Crystal Falls and Amasa, Mich. Thoburn Gibson, of Amasa, has been exploring under an option, and after putting down the first test pit which showed ore, sunk a row of pits by which ore was traced for 600 feet, the surface ranging from 4 to 14 feet. The width of the deposit was found to vary from 25 to 40 feet. Several analyses made show 64.40 metallic iron and .080 phosphorus. The deposit is in the N. W. ¼ of the N. W. ¼ of section 15, tract 44, range 33.

The old Alpha property in Mastodon township, Iron county, Mich., may be developed as the result of work now being done by Oglebay, Norton & Co. The ore body appears to be of good width and the ore is of good grade. As soon as the proper depth is reached in the shaft now being sunk the work of proving up the deposit will be started.

Of four properties located just south of Negaunee, Mich., idle before this season, one, the South Jackson, has been worked since early in the spring. The Davis, which belongs to the Breitung estate, is expected to start soon, and the Lucy is likely to be unwatered. The Milwaukee, the fourth mine, has been pretty well worked out and nothing may be done here.

JAMES O'DONNELL, manufacturer's agent for the sale of iron and steel products, 36 La Salle st., Chicago, has recently sold three lots of 1,000 tons each of open-hearth steel billets for a Southern Ohio steel works. As agent for the Finished Steel Co., Youngstown, O., and the Lebanon Iron Co., Lebanon, Pa., he has done a good business in the past few weeks.

THE Lochiel Rolling Mill Co., Harrisburg, Pa., has advanced puddlers to $4 a ton and a corresponding increase will be made in other wages. Nearly all the puddlers in the district are working at $4, and still a few mills are running single turn, owing to scarcity of puddlers.

THE strike at the Wellsville (O.) Plate & Sheet Iron Co.'s plant is practically at an end, and the strikers have failed in their attempt to have their union recognized. Enough men were brought from Pittsburg to put the entire plant in operation.

Review of the Technical Press.

BY DR. RICHARD MOLDENKE.

The Diffusion of Elements in Iron.—[*The Ironmonger*, May 6,] A most important paper by Professors Arnold and McWilliam was read before the Iron and Steel Institute recently, dealing with the remarkable property some elements have of leaving iron when subjected to prolonged heating processes. In the historical memorandum it is stated that Sir Lowthian Bell and Sir Frederick Abel first showed that carbon would leave a piece of steel and enter iron if both were heated side by side. Prof. Campbell showed that sulphur could diffuse through hot iron, a fact at first passed over as improbable by theoretical metallurgists, but since practically confirmed by the authors. Sir William Roberts Austin found that when fusing gold plates to lead, if the material were kept at a temperature of 480 degrees F., or much below the melting point of lead, for some time, the lead would be penetrated by a gold lead alloy. At the end of a month of continuous heating this alloy had gone through the bar, a distance of 2¾ inches. As a consequence of this phenomenon the authors had carried out a series of experiments with a view of learning more on the nature of segregation in steel ingots. To get reliable results it was necessary to heat steel for many hours in a vacuum to avoid oxidation. To do this a cylinder of nearly pure iron 3 inches long and 0.7 inches diameter was bored through accurately with a hole .35 inches in diameter. Into this tube, which was heated to 300 degrees F. to expand it slightly, rods of iron containing 1.5 per cent of the element the diffusive power of which was to be tested, were driven in solidly. On cooling a shrink fit was thus obtained with bright surfaces. Into the core a hole was bored for the reception of the thermo-couple and the whole was placed in a porcelain tube and heated in a vacuum at about 1,825 degrees F. for 10 hours. After cooling the test piece was centered and turned down in a lathe until a layer of one twenty-fifth of an inch of the jacket only remained on the core. This layer was now turned off nearly completely and analyzed to note the presence of the element supposed to diffuse out of the core. Eleven elements were thus tested, and heating at 1.825 degrees F. divided them as follows: Carbon, suplhur, phosphorus and nickel migrated, and manganese, silicon, chromium, aluminum, tungsten, arsenic and copper did not. As an additional source of information microsections were cut off and examined, the results corroborating the chemical data. The sections were cut through the core and jacket so as to note the appearance of the junction line of the two. In the case of sulphur the broad meshes of sulphide of iron in the core rich in sulphur cross over the junction line into the pure iron jaket, appearing in very fine veins which die away gradually. Phosphorus is evidenced by the distinct yellow color of the etched core extending outward over the junction line for one hundredth of an inch and then stopping abruptly. Nickel is seen in two bands, each 3-1,000 of an inch at the junction and differing from the color of the core and the jacket. Manganese is similar, but not so marked. The other trials showed nothing important. The phosphorus and nickel trials were repeated and gave concordant results, though the nickel seemed to be the result of a diffusion as a sulphide.

The question of how the elements diffuse is taken up next, whether they go as a free element or as an iron compound. To get at something tangible in this line three test pieces were prepared, one with the core of a steel running 0.38 per cent carbon, or unsaturated, the second with 0.89 per cent carbon, or saturated, and the third with 1.78 per cent carbon, or super-saturated. After heating in the same manner as the other specimens these compound test bars were turned down and the carbon of 8 concentric rings, 4 in the jacket and 4 in the core, was determined. The conclusion derived was that the higher the carbon in the core the more rapid the diffusion into the jacket. These experiments were repeated with the temperature varying instead of remaining constant at 1,825 degrees F. The results, according to the authors, show that the chances are very much against diffusion of the simple element carbon, but that the carbide of iron Fe_3C can diffuse as an unaltered compound. The reasons for this are discussed at great length. The authors now return to Prof. Campbell's experiments (reviewed in these columns at the time of their publication). Prof. Campbell found that the oxysulphide of iron will diffuse, but the pure sulphide would not. The authors find that while the oxysulphide would diffuse very readily, the pure sulphide went through the iron none the less As the experiments were made by heating these chemicals plugged up in a hollow cylinder of steel, the enormous pressure of the gases evidently helped to drive the melted sulphides through the opened structure of the shell.

In the discussion of the paper Mr. Stead went back to the experiments of Mr. Royston, who actually weighed the core and shell in his experiment before and after and found the loss of weight of the core equal to the increase of the shell and at the same time equal to the weight of the carbon which had migrated. Thus Mr. Royston had found that the carbon and not carbide of iron had passed over. Hence Prof. Arnold's conclusions were at variance with Mr. Royston's. Mr. Stead would like to have seen the diffusion of the other elements also tested by weighing. Mr. Hadfield pointed out the importance of working with pure materials to get reliable data. Mr. Harbord discussed the conditions of phosphorus in cold and hot iron, stating that he had always found it in three distinct states. Dr. Stansfield criictised Prof. Arnold's theory at some length and suggested that more data should have been obtained before the curves presented were constructed. Mr. Stead wanted to know why the sulphur should filter out in Prof. Campbell's and Prof. Arnold's laboratories and not out of the steels of England while still in the open hearth furnace. Mr. McWilliam and Prof. Arnold replied to the questions asked, and incidentally suggested that the sulphur in steel was probably present in the shape of a sulphide of manganese. Prof. Ledebur, in commenting on the above paper in *Stahl und Eisen*, July 1st, says that there is a marked difference in the diffuson of carbon and sulphur in iron. In the case of carbon the migration is from the rich to the poor piece, a continuation of the process doubtless ending in an equal amount of carbon remaining evenly diffused in both pieces. Iron in contact with carbon absorbs it as in the cementation and case hardening processes. The absorption of carbon, however, ceases when the iron is saturated. If, now, this iron is heated under oxidizing influences, all the absorbed carbon is removed again. Therefore it would seem that it is not necessary to go to the trouble of a carbide theory, but simply to believe that the element carbon dissolves in iron and travels in this way and not as a fixed carbide of iron. Sulphur compounds act differently. They filter out, so to speak, being found practically intact on the outside of the piece after the operation. This process is the basis of kernel roasting of iron ores in Sweden. The sulphur migrates from the interior of the lumps of sulphurous magnetites to the surface and burns off. The whole subject is one of exceeding inerest and complication, and has its practical aspects in the attempts certain to be made to uiltize any information obtained in this manner for the removal of the impurities in steel.

THE Savage Fire Brick Co. was established in 1871 at Keystone Junction, Pa., and was the first Savage company in the fire brick business, the brand "Savage" having been put on its brick for the past 28 years. The works started out with a capacity of 5,000 brick a day at Keystone Junction, and today the company is making 75,000 brick a day with works at Keystone Junction, Williams Station and Hyndman, Pa It owns 400 acres of flint rock clay in the Savage Mountains, and operates these properties in addition to mining upwards of 200 tons of coal a day. The company has also an extensive deposit of 97.85 per cent silica rock from which it manufactures its "Savage Silica" brick. These have been used in some of the most extensive open-hearth and glass furnaces in the country. The officers of the company are J. J. Hoblitzell, president, and W. T. Hoblitzell, treasurer, with general headquarters at Keystone Junction, Pa. The general sales office is at 814 Park Building, Pittsburg, with F. B. Pope as general sales agent. The current shipments of brick are the largest in the history of the company.

THE Globe Steel & Radiator Co., of Buffalo, has been incorporated in Delaware, with a capital of $1,000,000.

WORK OF THE INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.*

BY MANSFIELD MERRIMAN.

Prior to the year 1800 little was known of the properties of the materials of construction. Galileo had shown in 1638 that the strength of a rectangular beam varied with the square of its depth, Hooke in 1678 had announced the law that the stretch of a spring was proportional to the stress upon it, various authors had discussed the forms of beams of uniform strength, and Euler in 1744 had enunciated his formula for the resistance of columns under compression. Theory was far in advance of practice, for experiments had been so few and so imperfect that the elastic limit was scarcely recognized.

During the years from 1800 to 1850 great progress was made in the theory of elasticity, and a slow growth took place in knowledge of the properties of materials under stress. The introduction of railways and the consequent necessity of providing a firm roadbed and safe bridge structures gave a powerful stimulus to the investigation of metals in order that ample security might be afforded with the greatest degree of economy. The methods of testing, were, however, so imperfect that progress was slow, and, with the exception of the classic researches of Hodgskinson, the work of this period was mostly of value as a preparation for that of the future.

After 1850 large testing machines for special purposes began to be built, elongation and ductility began to be carefully studied, and soon after 1870 it was recognized by many manufacturers that physical tests of metals were imperatively necessary in order to secure uniformity of product. As these tests were multiplied and the records subjected to investigation, the knowledge was gained that the strength of a specimen depended upon its size and proportions and also upon the manner in which the load was applied. The term elastic limit assumed a new significance, when it became recognized that it could be defined and measured in different ways. In short, it was found that tests of materials must be made in a similar manner in order to render the results comparable. This idea, although long recognized, has proved a difficult one to realize. It has been discussed by many engineering societies, some of which have attempted to formulate standard methods. Finally the International Association for Testing Materials was formed in order to study the whole subject and endeavor to arrive at conclusions that should be authoritative.

Early Conferences on Uniform Methods.

In 1882, through the influence of John Bauschinger, a number of German experimenters met at Munich and discussed the question as to how uniformity in the methods of testing materils could be promoted. As a result of this meeting formal conferences were held at Dresden in 1884, at Berlin in 1886, at Munich in 1888, and at Vienna in 1893, delegates from other European countries being also often present. The reports of the proceedings of these conferences, published in Bauschinger's "Mittheilungen," attracted wide attention, and the great value and importance of the discussions became universally recognized in engineering circles. In short, the movement assumed an international character.

In 1890, as a result of the international congresses of engineering held at Paris in the preceding year, the French government appointed a commission to formulate standard methods for testing the materials of construction. Its report, published in 1894, in four large volumes, is one of the most valuable contributions to the subject, but from the first it was recognized that ultimate conclusions could not be determined by a commission of one nationality, and accordingly, since 1895, the French government has given hearty support to the work of the International Association.

In 1895, as a result of the four preceding conferences, the fifth conference met at Zurich, all European countries, except Turkey, being represented. The United States government was represented by an army officer, and the American Society of Mechanical Engineers by a delegate. At this congress the International Association for Testing Materials was formally organized, its object being, as stated in its statutes, "the development and unification of standard methods of testing for the determination of the properties of the materials of construction and of other materials, and also the perfection of apparatus for that purpose." This meeting at Zurich hence assumed an importance far greater than any preceding conference. and it may be called the first congress of the International Association.

At the Vienna convention of 1893, there had been appointed 20 committees on technical subjects, and reports from many of these were presented at the Zurich congress of 1895. These reports were published in the French and German languages in the official organ of the association called "Baumaterialienkunde," the first number of which appeared in July, 1896. The work of some of these committees was continued, other subjects were proposed for future consideration, and a council was organized to transact the business of the International Association in the intervals between the congresses.

Stockholm Conference in 1897.

In 1897 the second congress of the International Association was held at Stockholm, there being present 361 members, representing 18 countries. The United States government was represented by an army officer and a navy officer, and the American Society of Mechanical Engineers by a delegate. The congress continued in session for three days, reports of committees were presented, papers read and discussed, and plans outlined for future work. It was resolved that the next congress should be held in Paris in the summer of 1900, and the council was authorized to appoint technical committees to make reports at that time on special problems relating to the objects of the association.

At a meeting of the International Council held early in 1898 appointments were made of chairmen of 21 committees on technical problems, and the number of members on each committee from each country was assigned. It was also recommended in order to expedite the appointment and work of these committees, that the members in each country should meet and form a national section of the International Association. In compliance with this recommendation a number of American members met on June 15, 1898, and organized an American section, whose first annual meeting was held at Philadelphia on Aug. 27, 1898, and whose second annual meeting I now have the honor to address.

The membership of the International Association numbered 493 in 1895, 953 in 1896, 1,169 in 1897, 1,488 in 1898, and is now probably about 2,000. Germany takes the lead in regard to number of members, it having 387 in 1898, while Russia had 315, Austria 158, England 83, Switzerland 83, United States 68, Sweden 68, France 66, Holland 48, Norway 42, Denmark 39, Spain 36, Italy 35, and 60 from nine other countries. With regard to the American membership, it may be noted that it numbered 6 in 1895, 25 in 1896, 60 in 1897, 68 in 1898 prior to the organization of the American section, 106 in February, 1899, and that it is now nearly or quite 125.

Membership of the Association.

There are two peculiarities regarding membership in this association that deserve notice. First, there is no nomination or election of members, but any person desiring to be a member may do so on signing a statement that he assumes membership and will be governed by the laws of the association; in so doing he further assumes the obligation, stated in Article 5, of the statutes, that he will advance its interests to the best of his ability. Membership is hence a voluntary act assumed by an individual in order to promote the knowledge of the properties of materials and to endeavor to secure uniformity in methods of testing them. Withdrawal from membership may be made at any time by mere announcement to the proper officer of the association.

The second noteworthy feature regarding membership is that it may be assumed by a corporation or society as well as by person. For example, in the list of members of the American section, published in February last, will be found the Franklin Institute, the American Society of Mechanical Engineers, the American Foundrymen's Association, and five local engineering clubs, as also several steel companies, engineering journals and firms engaged in inspecting and testing. In Europe this feature is carried much further, the membership of the German section including the bureau of

* An address by Prof. Merriman, of Lehigh University, chairman of the American Section of the Association, at its second annual meeting in Pittsburg, Aug. 15-16, 1899.

public works of several cities, provinces and states, the police bureau of Berlin, the Prussian war department and the boards of direction of numerous railways, as also a large number of manufacturing corporations and engineering societies. Under this arrangement it is possible for a corporation to exert a greater influence than through the indirect individual membership of its president or superintendent, both manufacturers and consumers can make their wishes more directly known, and thus differences in regard to methods of inspection and testing can be more quickly harmonized than under the usual plan of strict individual membership. However, fully three-fourths of the total members are individuals, and these include engineers in all branches, architects, chemists, professors of mechanics and engineering, and superintendents and foremen of works.

At the Zurich congress the dues of members were fixed at $1 per year, and while no change was made at the Stockholm congress the council recommended early in 1898, in view of the heavy expenses, that each member should pay $1.50 per year. Accordingly, at the first annual meeting of this section, when our present by laws were adopted, the provision was inserted that each member should pay $2.50 per year, of which $1.50 should be transmitted to the International Association and the remainder to defray the expenses of the American section. This by-law went into effect on Jan. 1, 1899, and accordingly no dues were collected by this section for the year 1898, the $1.50 payable for that year being forwarded to the International Council, directly by each member or through the American member of that council. During the present year dues have been paid directly to our secretary, and his report, together with that of our treasurer, will be laid before this meeting.

The dues of $1.50 per year per member transmitted to the International Council are used by it in issuing its publications and in assisting its committees in defraying a part of the expenses of their special investigations. In addition to this income a number of societies and bureaus have agreed to make extra annual contributions, the Prussian war department heading the list with $125, and 21 others giving smaller sums, so that for the year 1898 the amount derived from these sources was about $400. Although official information is not at hand, it is safe to say that the total income of the International Association for the year 1898 did not exceed $2,000, which is certainly a small sum with which to issue its publications and carry on the work of 21 committees.

The International Association has issued yearly since 1895, a list of members, and also abstracts of the proceedings of the congresses of 1895 and 1897. These, together with a few circulars of information, constitute all the publications that it has been able to furnish free to its members. The detailed proceedings of the congresses have been printed in the journal "Baumaterialienkunde," published in the French and German languages, at Stuttgart, which has been furnished to members at $2 50 per year, the regular subscription price being $3.50. It will be seen, therefore, that an American member who desires to be fully informed regarding the work of the association must necessarily subscribe to this journal, and by so doing his dues become really $5 per year. It should further be stated that arrangements will probably be made so that the official announcements of the International Council and the proceedings of future congresses will be printed in this journal in the English language, as well as in German and French.

The American section, as already stated, had no income during 1898, and the report of our treasurer shows that during the present year the amount available for expenses has been about $120. On Feb. 18 a pamphlet of 26 pages was issued containing a list of officers of the International Association and its committees and a list of the American members, together with the statutes, by-laws and some historical information. In April a bulletin was issued giving abstracts of the proceedings of the first annual meeting and of the meetings of the executive committee, and in July a second bulletin was issued containing the preliminary program for this meeting. It is hoped that the condition of our treasury may permit these bulletins to be continued, and that one may be issued containing the proceedings of this meeting.

Nineteen Problems Under Consideration.

The technical questions proposed for discussion at the Pairs congress of 1900 are 19 in number. The organization of the international committees which are to consider these topics is now complete, and preliminary reports from the American members of several of them are to be presented and discussed at this meeting. Probably the most important of these subjects is that of standard international specifications for testing and inspecting iron and steel; this committee originally consisted of about 40 members, of which five were assigned to this country, but under authority to increase its numbers the American sub-committee has been increased to 21, has held several meetings, collected specifications, and will present a preliminary report of much interest. It is also expected that the American members of five other international committees on iron and steel will report progress in their organization and work. As the national sub-committees are now in full correspondence with the international chairmen, it is expected that the final reports which are to be presented for discussion at the Paris congress will prove of great interest and value.

Of the 19 problems to be considered by the 19 international committees six are on iron and steel, one on stone and slate, eight on cements and mortars, one on tile pipe, one on paints, one on lubricants, and one on the dry rot of wood. The fact that there are eight committees on cements and mortars and only six on iron and steel, may seem abnormal, but it should be remembered that in the testing of hydraulic cement the personal equation of the observer enters to a far greater degree than in the case of metals, and that its rapidly increasing use demands the immediate perfection of methods which will render comparable the work of different laboratories. At the session tomorrow morning preliminary reports from some of our sub-committees on these questions will be presented.

While the main object of the association is to establish standard rules for testing, it is recognized that this cannot be done until a thorough knowledge is obtained of the properties of materials under varying conditions. Accordingly the work of some of the committees is to collect and digest the information now on record, or to make scientific investigations that will render present knowledge more complete and definite. Thus, there is a committee on the properties of steel at abnormally low temperatures, one on the relation of the chemical composition of stone to its weathering qualities, one to digest the work of previous conferences and conventions, on the adhesion of hydraulic cement, one on the causes of the abnormal behavior of cements as to time of setting, and one on the protection of wood against the action of dry rot. Some of these subjects have already been discussed at the congresses of Zurich and Stockholm, and accordinly the reports to be presented to the Paris congress should contain positive additions to present knowledge.

Special Iron and Steel Work of the American Section.

At the annual meeting of this section, held last year, the desire was expressed to discuss the subject of impact tests, and a special committee was appointed whose report will be presented at this meeting. Later, other members requested that other problems should be taken up by the section, and accordingly three other American committees have been organized on special problems connected with the manufacture of iron and steel. While these committees have no connection with the international ones, it is believed that their work will add to the interest of our annual meetings, and further the general objects of the association.

There are advantages and disadvantages in doing technical work by committees. One advantage accrues through the harmonization of the different views held by individuals, whereby non-essentails are rejected and only fundamental methods retained. One of the disadvantages is that this process of harmonizing views takes time, causing reports to be long delayed, particularly with international committees. Some technical societies appoint committees with great reluctance, fearing that their reports may be regarded as official action. In the case of our international organization, no such fear is felt, and the report of a committee is to be considered from the same point of view as the paper of an individual member. Through the formation of the national sections, the work of the international committees can certainly be made more valuable and effective than ever before, for each national sub-committee, after having eliminated disagree-

ments of its individual members, can work as a body to impress its views upon the other national sub-committees. In many cases an international agreement may be found difficult to make, but if made after such full discussion it will be sure to be authoritative and valuable.

An International Laboratory.

The subject of the chemical analysis of iron and steel has been discussed in previous conferences and congresses, and at the Stockholm meeting of 1897 it was formally resolved to establish an international sidero-chemical laboratory at Zurich. It was stated that 15 smelting companies and iron manufacturers had pledged themselves to contribute $3,500 per year for this purpose, and that the polytechnicum at Zurich had offered the use of four well-equipped rooms. It was, accordingly, determined to open the laboratory in 1898, and an international commission was appointed to take charge of it and raise further funds for its maintenance. I am unable to state how fully this has been carried out, as no published accounts of its work have appeared. It is, however, to be doubted whether the establishment of chemical and physical laboratories falls properly within the scope of the objects of the association. If sufficient funds could be raised so that men of different nationalities might meet at such a laboratory to actually make analyses and tests, each criticizing the others, while at the same time learning from them, then undoubtedly effective work would be done in harmonizing differences and perfecting standard methods. It is to be hoped, if the establishment of the sidero-chemical laboratory at Zurich proves to be successful, that it may tend to further this method of research. It is, however, the opinion of many members that results as good, if not better, would be secured by arranging systematic schemes of investigation and distributing the actual work of analysis or testing among the laboratories of different countries.

A brief history of the organization and work of the International Association for Testing Materials, and that of its American section, has now been given. The great interest taken in the movement in so many countries is an index of the necessity felt in all branches of the engineering profession for the introduction of uniform methods of testing and inspecting the materials of construction. This work is one that must occupy many years, and which in a certain sense can never be finished, for constant progress will be made in our knowledge of the properties of materials. In order to carry it on with success it is apparent that more money will be needed than the small amount now raised from the annual dues of members. In Europe the importance of the work of the association is forcibly attested by the fact that engineering societies, bureaus of public works, iron and cement manufacturers, and railroads assist it by extra annual contributions, and it is to be hoped that the influence of this section may be sufficient to cause similar substantial gifts to flow into its treasury from American corporations.

Since the above was written a circular of the International Council has been received, containing the information that probably arrangements cannot be made for holding the congress of the association at Paris in 1900. It appears that the authorities of the Paris Exposition have the right to control the organization of all congresses held in that city in that year, and that they have announced one to be held on the subject of materials, and appointed officers to conduct the same. The subject will be discussed at this annual meeting, and expressions of opinion are desired as to whether it is best to abandon our congress of 1900, in order to co-operate with the one announced by the authorities of the Paris Exposition, or to hold it at London during the week preceding.

In conclusion, it is with pleasure that I congratulate the American section upon its activity and the association itself upon the bright prospects before it. The undertaking inaugurated by Bauschinger and his associates bore good fruit at the conventions of 1884, 1886, 1888 and 1893, and prepared the way for the Zurich meeting of 1895, which was at the same time the fifth convention and the first congress. At the Stockholm congress of 1897, the true international work was begun, and the problems there proposed are now the subject of careful study in all parts of the earth. Let us hope that the reports to be presented at the future congresses, will be such as to add to the present stock of knowledge, prove advantageous to both producers and consumers, and assist all engineers in economically using the materials and forces of nature for the benefit of man.

CONDITION OF BLAST FURNACES OF U. S.*

August 1, 1899.

Location of Furnaces.	Coke and Anthracite.					Charcoal.				
	Total No. of Stacks.	In Blast.		Out of Blast.		Total No. of Stacks.	In Blast.		Out of Blast.	
		Number.	Weekly capacity.	Number.	Weekly capacity.		Number.	Weekly capacity.	Number.	Weekly capacity.
New York	13	4	4976	9	6150	2	2	195	0	0
New Jersey	3	3	2103	0	0	.....	.....	.....	.....	.....
Spiegel	3	3	285	0	0	.....	.....	.....	.....	.....
Pennsylvania:						13	2	108	11	550
Lehigh Valley	27	15	8367	12	4825	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	90	.....	.....	.....	.....	.....
Schuylkill Valley	14	9	5524	5	4597	.....	.....	.....	.....	.....
Upper Susqu. Val.	5	4	3634	1	600	.....	.....	.....	.....	.....
Lower Susqu. Val.	10	6	4874	4	1286	.....	.....	.....	.....	.....
Lebanon Valley	11	10	7145	1	534	.....	.....	.....	.....	.....
Spiegel	1	1	300	0	0	.....	.....	.....	.....	.....
Pittsburgh	39	28	60091	1	2450	.....	.....	.....	.....	.....
Spiegel	1	1	1066	0	0	.....	.....	.....	.....	.....
Shenango Valley	16	15	21676	1	1000	.....	.....	.....	.....	.....
Western Pennsylvania	19	11	13013	8	4183	.....	.....	.....	.....	.....
Spiegel	1	1	510	0	0	.....	.....	.....	.....	.....
Maryland	5	3	5700	2	1850	4	0	0	4	569
Wheeling District	10	9	12032	1	1400	.....	.....	.....	.....	.....
Ohio:						8	2	129	6	420
Mahoning Valley	13	11	18365	2	1790	.....	.....	.....	.....	.....
Central & Northern	11	10	15006	1	2600	.....	.....	.....	.....	.....
Hocking Valley	3	1	400	2	703	.....	.....	.....	.....	.....
Hanging Rock	11	8	4649	3	790	.....	.....	.....	.....	.....
Illinois	16	15	21378	1	700	.....	.....	.....	.....	.....
Spiegel	1	1	561	0	0	.....	.....	.....	.....	.....
Minnesota	1	0	0	1	629	.....	.....	.....	.....	.....
Wisconsin	4	4	3639	0	0	.....	.....	.....	.....	.....
Missouri	2	1	950	1	600	.....	.....	.....	.....	.....
Colorado	3	2	2850	1	800	.....	.....	.....	.....	.....
Virginia	20	10	6282	10	6936	4	0	0	4	437
Kentucky	5	5	2658	0	0	3	0	0	3	200
Alabama	30	20	19007	10	7810	7	2	685	5	950
Mich., Mo. and Wis.	.....	.....	.....	.....	.....	15	7	3456	8	3393
Tennessee	12	10	7603	2	950	5	3	893	2	410
Georgia	2	0	0	2	960	3	1	375	2	300
North Carolina	2	1	600	1	400	.....	.....	.....	.....	.....
New England	.....	.....	.....	.....	.....	11	2	185	9	805
Texas	.....	.....	.....	.....	.....	4	1	163	3	750
Utah	.....	.....	.....	.....	.....	1	0	0	1	175
Oregon	.....	.....	.....	.....	.....	1	0	0	1	275
Totals	305	221	261483	83	54633	81	22	6189	59	9234

SUMMARY.

Fuel.	In Blast.						Out of Blast.			
	Number.			Weekly Capacity.			Number.		Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	22	20	22	6,189	6,018	6,59	59	61	9,234	9.477
Coke and Anthracite	222	217	165	261,483	257,345	200,318	83	89	54,633	54,481
Total	244	237	187	267,672	263,363	206,777	142	150	63,867	63,958

*Condensed from the *Iron Age*.

Indiana Gas Belt Industries.

The Custer Electric Mfg. Co., of Marion, Ind., is doing a good business in general repair work and will soon commence the manufacture of emery grinders on quite an extensive scale.

The Marion Gray Iron Foundry Co. reports an increase of 100 per cent in business as compared with last year. The company makes high grade iron for glass molds and is about to establish a new plant in Logansport, Ind.

The Bennett Saw & Machine Works of Kokomo, Ind., furnish complete outfits for saw mills besides doing a general jobbing business. They are agents for the Star Felloe machine and report an increase of one-third in business this year over that of 1898 for the first seven months.

The Globe Steel Range Co., of Kokomo, Ind., has been organized one year and is doing a steadily increasing business. The company confines its work exclusively to steel ranges for family use.

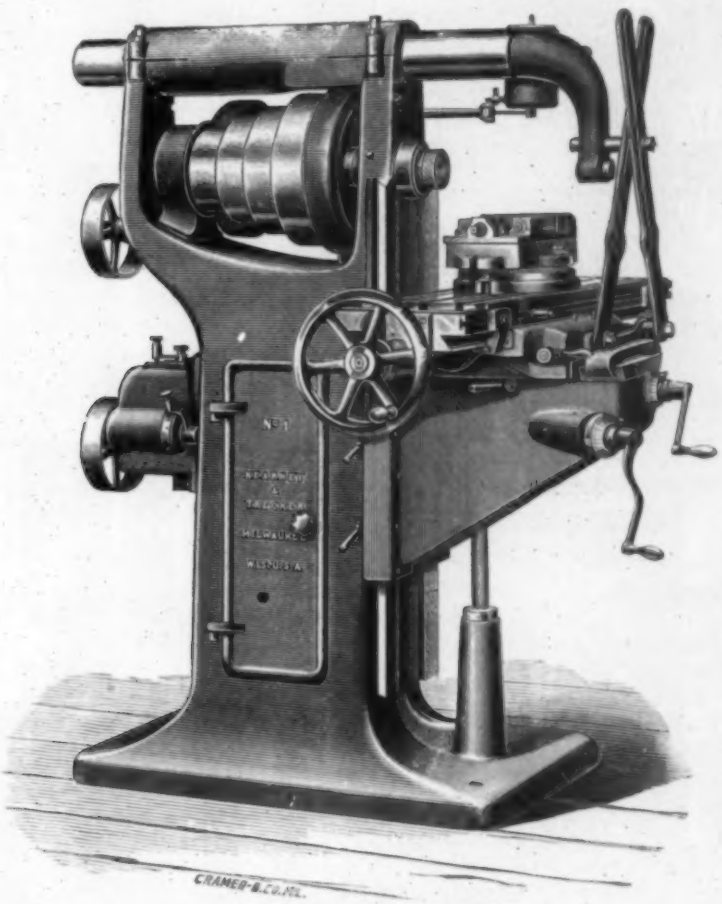
The Marinette Iron Works Mfg. Co. took possession of the Marinette (Wis.) Iron Works last week. Gas engines and automatic screw machines will be manufactured.

PLAIN MILLING MACHINE.

The illustration below is of the No. 1 plain milling machine of Kearney & Trecker, of Milwaukee. It was designed with a view to the greatest range with the least overhang of parts; and it was the aim to secure a rugged, compact machine capable of taking heavy cuts and efficient on general work requiring wide range and easy adjustment. The spindle has a ¾-inch hole through its entire length and the front end is bored to receive No. 10 B. & S. taper shanks on the cutter arbor and collets. The front end is threaded to receive a chuck or large cutters, and the thread is protected from injury by a knurled collar. The spindle boxes are of bronze, the front one being solid and tapered inside. The cone pulley has four steps for 2¾-inch belt, the largest being 12¼ inches diameter and heavily back geared. The back gears and all other gearing on the machine are protected from dirt and chips.

The overhanging arm has an adjustable bronze bushing to support the end of the arbor and the arm braces afford additional stiffness. These braces are so constructed that they can be removed or replaced on the machine without taking off any nuts. The table is 10 x 44 inches over all, including oil pans; 10 x 36 inches of working surface; with three tee slots ⅝ inch wide. It has screw feed with a convenient quick return. The knee has 20 inches of vertical movements, is a box section and without hole through the top. The saddle has 8 inches of adjustment in line with spindle.

The feed of the table is automatic in either direction through 28 inches, is thrown in or reversed by the same handle on the front of the machine and can be tripped either automatically or by hand, under full cut or when running light. There are 12 changes of feed varying from .006 to .130 inches per revolution of the spindle, and any one can be obtained without shifting a belt or removing a gear. A dial plate shows where to place the lever for any rate of feed. Ball bearings are provided to take the thrust of the elevating and table screws. The vise swivels on a graduated base from which it can be removed and used as a plain vise. It will open 4½ inches without the steel jaws, which are 6¼ x 1⅝ x ½ inches. The countershaft has two 12-inch friction pulleys for 3½-inch belt that should run 110 and 170 revolutions per minute. The column is cast in a single piece.



NO. 1 PLAIN MILLING MACHINE.

UNPRECEDENTED OUTPUT OF COKE.

The figures of the Connellsville *Courier* show that the output of coke from that region in the first half of 1899 was greater by 500,000 tons than for any other half year. The shipments from Jan. to July 1 aggregate 248,619 cars, containing 4,792,139 tons, which indicates that the production of the region for the year will be nearly 10,000,000 tons. The next largest year in the history of the region was 1898, when the shipments were 8,460,113 tons. Last year the shipments for the first half were 4,156,961 tons; for this year to July 1 they were 4,792,139 tons. Pittsburg figured largely in the shipments this year, 81,911 cars having been consigned to the furnaces there, with a total of 1,515,000 tons. The Pittsburg furnaces will use this year something like 3,000,000 tons of Connellsville coke.

For the week ending Saturday, Aug. 5, the record of operations showed that of 18,696 ovens in the region 18,146 were active and 550 idle, the estimated production for the week being 191,261 tons, as compared with 191,541 tons the week previous.

The Federal Steel Co. is reported to have filed a deed at Uniontown for about 3,000 acres of coal land in Nicholson, German and Menallen townships. The land embraces the balance of the Du Puy and Hillman tracts not included in the purchase reported a week ago.

When W. J Rainey completes 300 new bee-hive ovens on the Revere tract, which he purchased recently, in the same section of the county, it is reported that the entire production of the plant will go to the National Steel Co., which with the product of the 723 ovens at Oliver, which it also controls, will then have more than 1,000 coke ovens furnishing it exclusively with Connellsville coke.

THE Erie, the Buffalo, Rochester & Pittsburg and the Western Pennsylvania railroads have ordered 2,500 freight cars from the Pressed Steel Car Co., the combined orders aggregating $2,750,000. The cars are all to be of 100,000 pounds capacity hopper pattern, to carry ore and coal. Deliveries are to be made beginning in June, 1900. The Pressed Steel Car Co. is turning out 55 cars a day.

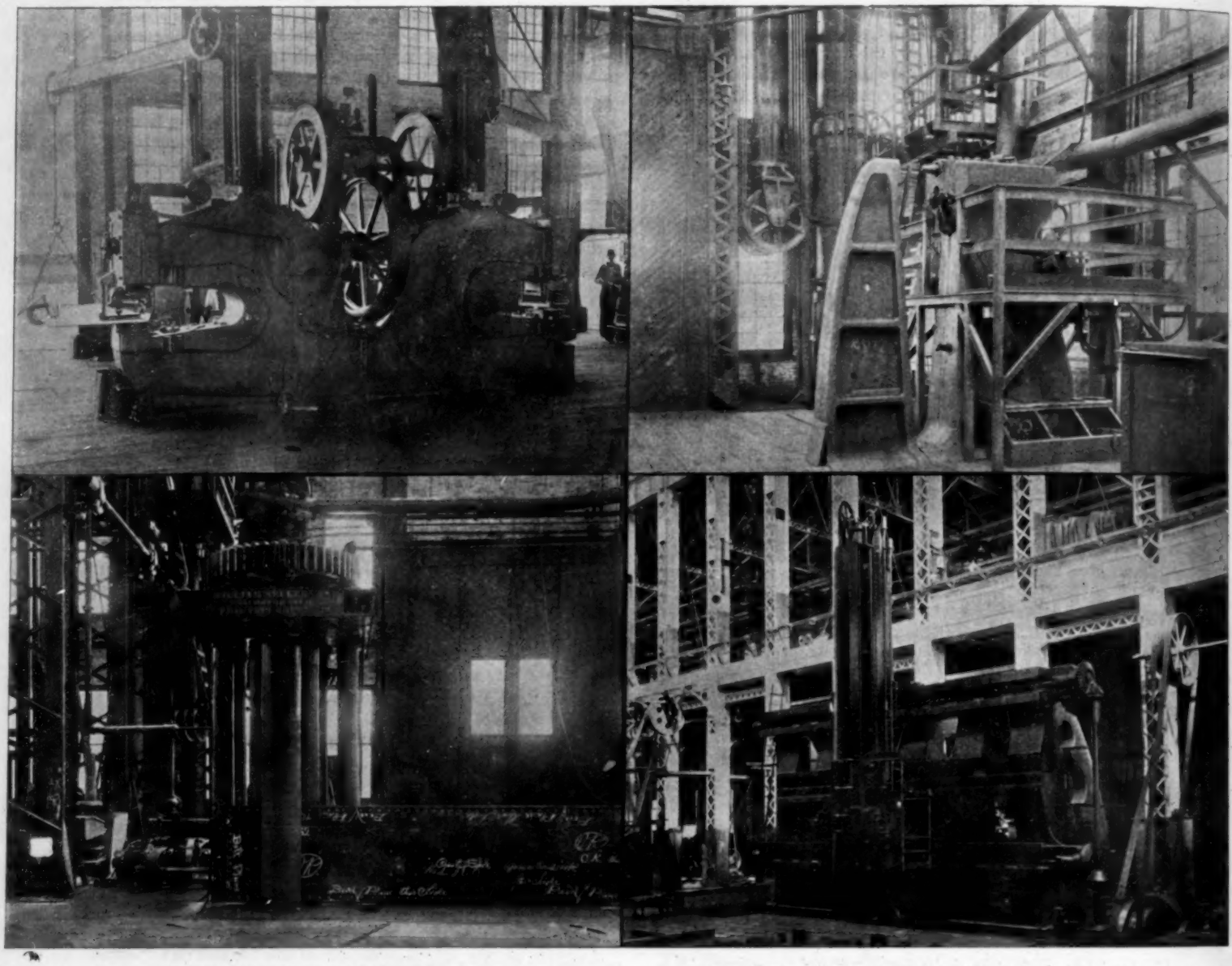
THE Western Electric Co., of Chicago, has filed a certificate of increase of capital stock from $3,590,000 to $8,000,000.

HEAVY SHIPBUILDING TOOLS.

Some idea of the exceptional size and strength of the tools employed at the great shipyards of the country is conveyed by details recently given by the *Marine Review*, of the equipment of machine shop and other departments of the Newport News Ship Building & Dry Dock Co., at Newport News, Va. From this account we take the accompanying extract, and present with it views of four of the large machines, representative of the different departments of the plant:

In the boiler shop, 300 x 100 feet, is a 60-horse-power motor. The shop is fitted with a 15-ton hydraulic crane, and there are straightening rolls for 5-ft. plates and also rolls for 11-ft. plates. A combination punch and shear is 23 inches in the throat, and a horizontal punch, manufactured by William Sellers & Co., will punch holes up to 1½ inches in diameter in plates up to 1 inch. The equipment includes also four blacksmith forges and 12-ft. bending clamps; a William Sellers & Co. punch, 30 inches gap and capable of punching a 1-inch hole in 1⅛-inch plate; a William Sellers & Co. 24-ft. planer and a 14-ft. butt planer. The man-hole cutter was manufactured by Bement, Miles & Co., and in it plates up to a thickness of 1⅛ inches may be handled. The Morgan Engineering Co., Alliance, O., has supplied a flanging machine with 10-inch cylinders and with a capacity for ¾-inch plate. Two other Sellers machines are a shear, 23 inches gap, and upright rolls, 9 feet wide, which will bend 1⅝-inch plate. The Morgan Engineering Co. has also supplied a hydraulic riveter, which works under a pressure of 1,500 pounds, and there is a 40-ton hydraulic traveling crane made by R. D. Wood & Co. of Camden, N. J.; also an 80-ton electric traveling crane.

The ship shed has a Long & Alstatter guillotine shear, which cuts through a maximum thickness of ⅞ inch and takes material up to 4 feet 6 inches at one cut. There is an automatic shear blade grinder which will grind a plate up to 5 feet in length, and a cold saw capable of sawing beams 6 inches thick and 12 inches wide. There is a Bement, Miles & Co. square and round punch, with a diameter of 3 inches, designed for a ¾-inch plate. A William Sellers & Co. plate shear is 39 inches in the throat and handles plates ranging from ¼ to 1⅜ inches. Other machines are a 28-ft. plate planer; William Sellers plate punch, 39 inches in the throat; Bement, Miles & Co. shear, 36 inches in throat, and a punch of the same manufacture 30 inches in throat. The three latter machines take plates ranging from ¼ to 1¼ inches in thickness. Other machines in the equipment are as follows: Three radial counter-sinking machines for counter sinking plate, ¼ to 1½ inches; an 18-ft. Bement, Miles & Co. planer; 32-ft. Hilles & Jones planer; a set of 16-ft. plate bending rolls, manufactured by Bement, Miles Co.; four Long & Alstatter plate punching machines, with a capacity for plates ranging from ¼ to 1 inch; 6-ft. plate straightening rolls of Bement, Miles & Co. manufacture; four radial drill presses for drilling holes ¼ to 2 inches in diameter; two portable drill presses supplied by Bement, Miles & Co. and designed to drill holes not over 1¼ inches; plate scarfing machine for plates up to 5 feet 10 inches, by the Pedrick & Ayer Co., Philadelphia, and a horizontal universal drill punch manu-



48-INCH GAP DOUBLE PUNCH—SHIP SHED.
10-FOOT VERTICAL BENDING ROLLS—BOILER SHOP.

HYDRAULIC BULL, 10 FEET 6 INCHES GAP—BOILER SHOP.
22-FT. X20-FT. HORIZONTAL AND VERTICAL PLANING MACHINE—MACHINE SHOP.

factured by the Deetrick & Harvey Machine Co., of Baltimore, which is capable of drilling holes 3 inches in diameter. In this building are the 32-ft. bending rolls, which have the distinction of being the largest in the world, and which were manufactured by Bement, Miles & Co , of Philadelphia, from special designs furnished by the Newport News Co. These rolls are driven by a 50-horse-power engine and are regulated by hydraulic power. They are used for flanging purposes only.

A fortune has been spent for the tools and machinery with which the machine shop is equipped. There are 84-inch, 60 inch and 36-inch planers manufactured by William Sellers & Co., of Philadelphia. A wall planer installed by Bement, Miles & Co., of Philadelphia, is the largest in the world. The planer measures 22 feet and the slot 22 feet. This machine is a combined planer and slotter and is operated by a 50-h. p. General Electric motor. The plant of vertical boring mills, supplied by the Niles Tool Works, of Hamilton, O., includes one 10 x 16-ft. mill, one 8-ft., one 6-ft. and one 5-ft. There is a 125-inch shafting lathe, also furnished by Bement, Miles & Co., which will take 34 feet between the centers and has a swing of 125 inches diameter; a cylinder boring mill of 12-ft. bore, manufactured by William Sellers & Co.; and two vertical boring mills manufactured by Bullard & Co. Ten new Bullard lathes as follows: One 36-inch; two 32-inch; one 26-inch; one 52-inch, and four 20-inch. Also a 63-inch lathe of Bement, Miles & Co. make, which takes in a shaft 75 feet long, and a 36-inch lathe; distance between centers, 26 feet. Then there are four 26-inch lathes manufactured by the Pond Machine Co., of Plainfield, N. J., with beds ranging from 12 to 28 feet; two horizontal drill presses of Bement, Miles & Co. manufacture, of 15-ft. drill radius. Other machines supplied by the Philadelphia firm are: Two horizontal drill presses of 10-ft. radius; four horizontal boring mills—two of 52-inch cylinders, one 30-inch and one 26-inch; four 16-inch shapers; three 12-inch slotters; one 16-inch slotter and one 24-inch slotter. In addition to these are one Richards open side planer, furnished by Pedrick & Ayer; four 24-inch turret lathes of the Bullard type; three small turret lathes; six brass lathes and six Bullard engine lathes, adapted for general brass turning. There is also a liberal outfit of drill presses. The present machine shop is an enlargement from a former structure, and is divided into machine shop proper and erecting shop. There is a 40-ton electric traveling crane in the erecting shop and a 50-ton electric traveling crane in the machine shop; five 5-ton hydraulic cranes on piers and two 5-ton electric cranes in the wings.

A NUMBER of announcements have been made from New York concerning the Union Steel & Chain Co. incorporated under the laws of Delaware. The capital proposed is $60,000,000, of which $30,000,000 is to be 7 per cent non-cumulative preferred stock and $30,000,000 common stock. Of each kind $20,000,000 will be used in acquiring properties. Little definite is given about the plants to be taken in except that 100 are being examined, and that they include rolling mills, blast furnaces, steel plants, chain works and ore and coal mines—rather a miscellaneous assortment. The Cleveland Steel Co., in which Frank Rockefeller is interested, is named as one of the probable factors in the combine. The names of directors given out are Perry Belmont, James W. Hinckley, Thomas S. Holmes, Henry W. Poor and H. L. Horton, of New York; Frank Rockefeller, of Cleveland, and William Rotch, of Boston. E. L. Harper and Ralph K. Paige have been at work on the proposition.

The Star Corundum Wheel Co. of Detroit, one of the progressive concerns in its line, has been making additions and improvements to plant and equipment recently, and is now in position to meet the increasing demand for its product. A general line of emery and corundum wheels is manufactured, and the rapid expansion of the company's business is taken as evidence that its abrasives are equal to all the demands for grinding purposes.

THE American Pig Iron Storage Warrant Co.'s stocks were 42,500 tons on Aug. 10, 1,500 tons having been put in yard and 1,500 tons withdrawn in the preceding 10 days.

MEMORANDUM ON CAST IRON UNDER THE TRANSVERSE TEST.

BY DR. RICHARD MOLDENKE.

[Supplemental to the report of the American Foundrymen's Association Committee on Test Bars. Details of tests of three series of bars, A, B and C, have been presented in these columns heretofore.—ED.]

In the transverse tests made with Sets A, B and C, the distance between the supports for the bars was always taken at 12 inches, the bars themselves being but 2 inches longer. This distance was selected after a careful consideration of the subject. It is a convenient length for such tests; the foot, moreover, is also a unit of distance; the bars can be cast vertically without trouble, and their weight is not excessive. As the bars selected for the transverse test in a full set number 128, one can readily imagine the difficulties which would be encountered in attempting to get them three or even five feet long. A bar four inches square and five feet long would be a cumbersome thing to test.

An important consideration influenced the adoption of the foot as a standard distance between supports in these tests, and that is the well known fact that with a given testing speed, the longer the bar the less searching the test. A five-foot cast iron bar will support a very much greater load before breaking if this is applied gradually and without the least jar than it will if the load is put on quickly and with shocks. In the latter case the bar simply has no time to adjust itself to rapidly changing conditions which may require twice as much resisting power on its part than it needs under the static load, and hence it breaks much before it would have done had it been able to yield slowly as the pressure increased. On the other hand it is also known that with perfectly steady loads the quicker they are applied the higher the results, though this is more marked in the elastic materials than in cast iron. With our testing machines as usually constructed the question of speed is such that it is better to test a short bar slow than a long one fast. Again the service conditions for cast iron are of a kind that make it desirable to know how it will behave under quickly applied loads, castings usually failing under shock. To keep the transverse test separate from the impact test (with its special feature of absorbing energy for deformation purposes) and yet take into account this service requirement means a short bar tested quickly.

It was therefore deemed wise to obtain some information on the influence of the length of the bar upon the results from cross breaking tests. To make the data secured comparable it was necessary to adopt a system of casting which would bring the required number of test bars under identical foundry conditions. This was accomplished by making six patterns of a 2-inch square bar 16 inches long. Each pattern was provided with a conical pouring gate at one end, all six being molded gate end up in an iron flask in such a way that the gates were in the bottom of a trough for flushing in a large quantity of metal quickly. The molds were of dry sand and the cast was repeated with six different heats. In this way a series of bars was obtained in which not only six different tests could be made on material exactly alike, but the same tests could be repeated five times on different heats to obtain good working averages.

For the preparation of this series of test bars the committee is indebted to the generosity of the Frank Kneeland Machine Co., of Pittsburg, Pa., who went to considerable trouble in making patterns and castings to exactly fulfill the requirements of the case. The tests themselves were carried out as follows: With the same testing speed the six bars of each set were broken transversely with a distance between supports of 6, 8, 10, 12, 14 and 16 inches. The range from 6 to 16 inches is a fairly wide one, and together with the deflections noted gives a good basis for comparisons. The following table gives the averages of the results obtained:

BARS 2"x2"x16". HEAVY MACHINERY MIXTURE.

Average cross section. Depth	Width	Supports apart.	Average breaking strain. (lbs.)	Average modulus of rupture per sq. in.	Average deflection.
1.96"	2.02"	6"	34,650	40,000	.063
1.96"	2.00"	8"	25,100	39,070	.070
1.98"	2.00"	10"	18,720	35,660	.064
2.00"	1.99"	12"	16,380	36,970	.080
2.00"	1.98"	14"	13,560	35,900	.094
1.99"	1.99"	16"	11,370	34,380	.096

Representing the average modulus of rupture per square

inch in the above table graphically, we obtained a very interesting curve:

But for the 10-inch point the curve would slope downward nearly uniformly. That the break is correct is shown by the same tendency in the curves plotted for each set separately. Whether this break would exist in that place or at all in bars of other cross sections must be left unanswered here. Another interesting speculation would be what influence would result from a testing speed perfectly uniform throughout each test, but increasing as the distance between supports increases (let us say, so that for a given time the quotient of the length divided by the deflection remains constant).

It is possible that with a constant testing speed there is a point in transverse tests of cast iron at which the increase or decrease of a fixed ratio between the depth of the bar and the distance between supports (10 inches divided by 2 inches, or 5 in this case) may mean a change from one set of conditions to another. If this be the case, it is evident that the matter will be more serious in heavy bars than in light ones, and that with 10 inches, for the 2-inch square or heaviest likely test bar, it would be very much less for say a half inch bar. Now in testing the iron it would be unsafe to accept everything up to this distance of 10 inches, and beyond 10 inches the results would gradually lose in value the further they went. Therefore the 12-inch distance between supports would seem the safest and yet smallest distance to adopt with bars approaching a fairly heavy cross section, and would very likely be just as acceptable in the case of the smaller ones.

For our purposes, however, it is sufficient that five points out of six are in line, and that therefore the ordinary formulæ used in calculating the cross breaking strength of beams are not only incorrect for cast iron, on account of the chemical differences in the iron itself when in different cross sections, but that with the cross sections identical the distance between the supports must be specially provided for by suitable constants in whatever formulæ may be developed. As seen from Fig. 1 the doubling of the distance between supports means a drop in the modulus of rupture per square inch of the same iron in the same sized bar of nearly 10 per cent.

Another point of interest is a development from this series of tests. The resilience of the material or its shock resisting power is often calculated from the transverse test by dividing the half product of the breaking load with the deflection by the weight of the bar between supports, the result being the shock resisting modulus in inch pounds per pound of metal. From the table we have:

Distance between supports .	6″	8″	10″	12″	14″	16″
Modulus	176	107	58	53	44	33

or a steady progress on downward. As the bars of each set were exactly alike in material and had the same dimensions, their shock resisting quality should certainly be the same, yet the formula regularly employed make the first result over five times as good as the last. That the shock resisting moduli will be lower for thick sections than for thin ones is known, but that so great a discrepancy should exist with the same dimensioned bars when tested as indicated is surprising.

But one point remains. All the bars were cast vertical. As in the case of casting bars flat, there is a noticeable difference in their strength when tested bottom or top side up, so with the vertical bars there is a feeling that the lower portion might give different results from the upper. The broken pieces of the above tests were therefore again tested transversely and the results noted. In this case the pieces were all broken transversely with supports 6 inches apart. While the bars have already been strained beyond their elastic limit (at one end) and the results cannot therefore be accepted as perfectly reliable, yet the comparison is of sufficient value to be worth recording.

The average pressure required to break the upper halves of the 36 bars is 36,560 lbs., as compared with 36,180 lbs. for the lower, a result sufficiently close to be quite satisfactory.

The several points brought out in this study may be of interest to those who care to pursue the subject further, the scope of the work, so far as the committee is concerned, being filled in obtaining the information relative to the use of 12 inches as the distance between supports of bars tested transversely.

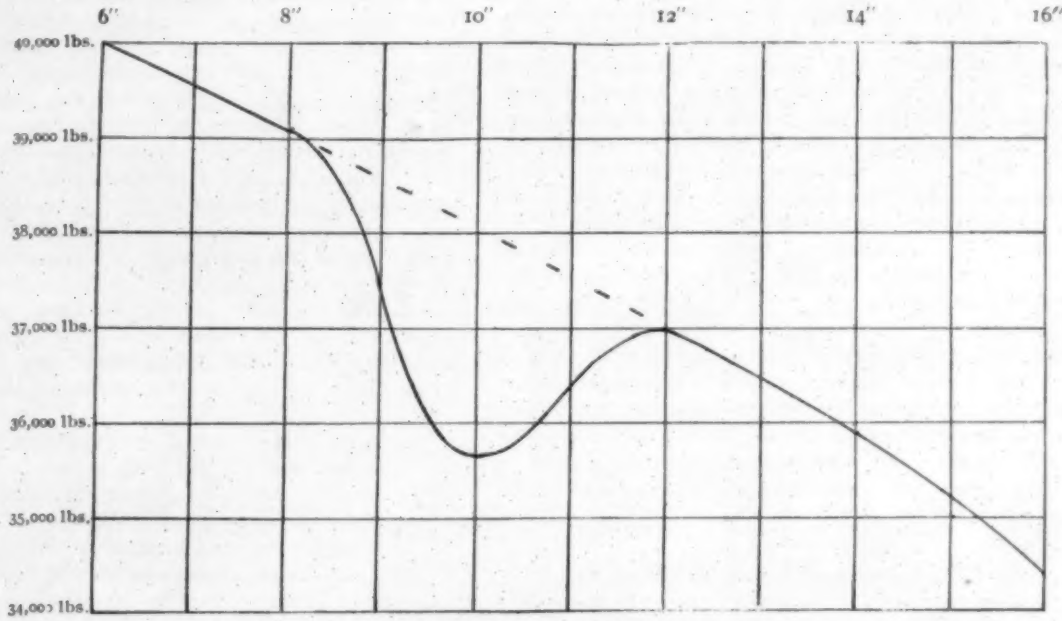


FIG. 1.—AVERAGE CURVE OF SIX SETS OF TESTS.

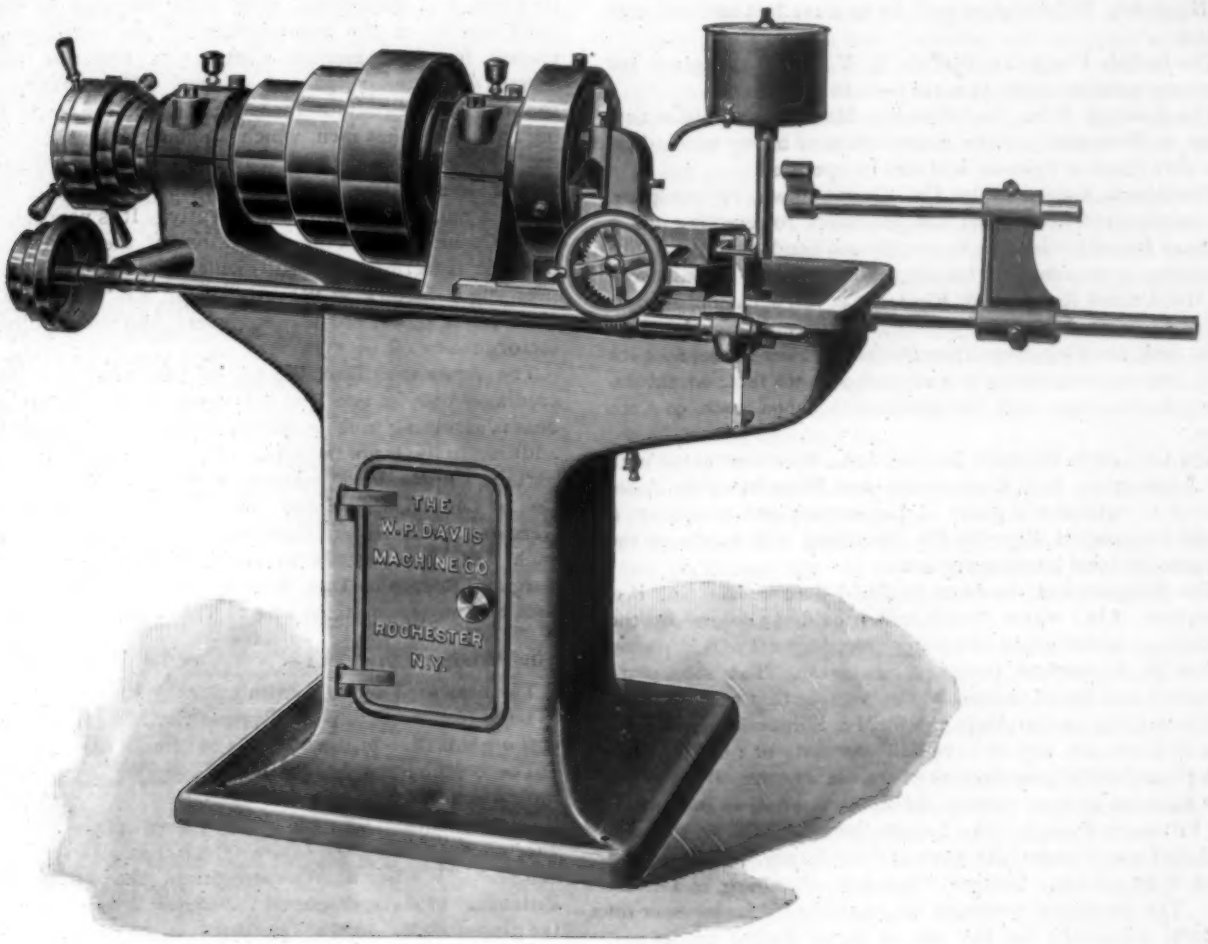
RYLAND'S *Iron Trade Circular* says that during the second quarter of this year 11 furnaces were blown out in Great Britain and 11 were blown in. At the present time four furnaces are being built—one in Derbyshire, one in Northamptonshire, one in Shropshire and one in Yorkshire. There are also 21 British furnaces being rebuilt. The *Iron and Coal Trades Review* says: "So far as available figures go the present rate [July] of production of pig iron in Great Britain is about 900,000 tons a year in excess of the figures of a year ago. Thirty more furnaces are now in blast than in July of last year. Of that number, however, some 12 or 15 were out of blast last year owing to the coal miners' strike in South Wales, which lasted, and kept the majority of the Welsh furnaces unemployed, until the end of September, 1898."

THE recent convention of the Amalgamated Association authorized the publication of a weekly labor paper by the Association and left the matter in the hands of the lodges, which have now voted almost unanimously in favor of having such a paper. The question is now being discussed as to whether a paper now in existence shall be purchased or a totally new one started.

PRESS dispatches state that the Cambria Iron Co., of Johnstown, Pa., has made a reduction in the pay of straighteners and hold-ups in the beam yard, placing them on a day rate instead of a tonnage rate. Under the old arrangement the increase in tonnage handled had increased above the proper proportion.

IMPROVED CUTTING-OFF MACHINE.

A three-inch improved cutting-off machine is presented to the trade by the W. P. Davis Machine Co., of Rochester, N. Y. It is designed to cut round iron and steel from ½ inch to 3 inches in diameter. Its features will be noted with interest by those familiar with the service required. Th spindle bearings are large and long, the cones are of ample width and diameter. There are two powerful chucks, one on each end of the spindle. The tool-post or holder is of unusual strength and stiffness, and is provided with two lateral adjusting screws, so that after once setting the tool perfectly true it can be removed for grinding and replaced in its original position without loss of time and without changing its distance from its length gauge. There is an automatic throw-off, which stops the feed when the piece is cut off. The length gauge is provided with a finger at its forward end which can be thrown over after gauging the length, thus preventing cramping of the tool as the piece drops off. The countershaft has two changes of speed, making with the changes on the cone six different speeds for the main spindle. The pulleys on the countershaft are driven by a simple clutch, so that by an instantaneous movement of the lever the speed may be accelerated as the tool approaches the center. Friction pulleys on countershaft are 12 inches in diameter, 4 inches face, and should run 70 and 100 turns a minute.



THE Pneumatic Crane Co. has thoroughly overhauled the plant formerly occupied by the Westinghouse Machine Co. at 26th st. and Liberty ave., Pittsburg, and will begin soon the manufacture of a new design of crane to be operated by compressed air.

THE Deering plant of the Garden City Wire & Spring Co., of Chicago, has been purchased by the American Steel & Wire Co. The product is springs and high carbon wires. The Garden City company's plant at Cragin, Ill., it retains, this being a rolling mill, which is now being rebuilt after the recent fire.

THE liabilities of the Biehlen Foundry & Machine Co., of St. Joseph, Mo., which failed last week, are $20,000.

INDUSTRIAL SUMMARY.

[I you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

At Anniston, Ala., the Southern Car & Foundry Co. is installing engines, roll trains, furnaces, etc. with a view of practically doubling the output of its rolling mill and forge departments. O. M. Stimson is manager.

Outside capitalists have been negotiating for the purchase of the machine shop and foundry of the National Mfg. Co., Huntsville, Ala, with a view to putting it in operation.

W. J. Woolly has bought the old bolt works at Anderson, Ind., and will use the plant for the manufacture of gas engines.

A new malleable casting plant is being figured on at Peoria, Ill. The C. B. & Q. railroad is interested, and the proposed site is on its tracks.

The Akron Electrical Mfg. Co., Akron, is to consolidate with the American Electric Tool Co., of Akron, and a Cleveland electrical company, and increase its plant and equipment.

A new industry proposed for Canton, O., has taken the name Ohio Steel Co. The Eagle crucible steel works of Canton have been absorbed, and tool steel and steel castings will be manufactured. An open-hearth furnace is to be built.

A list of tools for the new machine shop at the Brooklyn Navy Yard, for which bids will soon be opened by the Navy Department, includes one 96-inch, one 60-inch, one 48-inch, one 42-inch, three 36-inch, one 30-inch and one 16-inch, one horizontal boring, drilling and milling machine; one portable milling, boring and drilling machine; one horizontal boring and milling machine, one horizontal boring and drilling machine, two universal horizontal drilling and boring machines, one 30-inch boring and turning mill, two 42-inch boring and turning mills, one extra heavy 10 x 16 ft. boring mill, one 9-ft. universal radial drilling machine, two 72-inch universal radial drills, two 72-inch semi-universal radial drills, five 72-inch radial drills, three 37-inch back-geared power feed drill presses; eight 30-inch back-geared power-feed vertical drill presses; eight 21-inch vertical drills; six 16-inch sensitive

drills; six 13-inch sensitive drills, and two universal milling machines.

New Construction:—

The Ingersoll Milling Machine Co., which has been negotiating with Youngstown, O., and other cities with a view to removal, has decided to remain in Rockford, Ill., and to build an addition to cost $8,000 to $10,000.

For the plant of the new Auto-Car Co., of Pittsburg, power will be furnished by gas engines. The main building, two stories, will be 50 x 200 feet. There will be in addition a blacksmith shop, storage house, office and paint shop.

It is stated at Birmingham, Ala., that F. B. Nichols, formerly vice-president and general manager of the Howard Harrison Pipe Works, Bessemer, Ala., is promoting a company which will build a large pipe factory in the Birmingham district, to be independent of the United States Cast Iron Pipe & Foundry Co.

David Carlin, of Allegheny, Pa., is reported to be organizing a company to erect a plant for the maufacture of soil pipe.

The Fosdick-Holloway Machine Tool Co., Cincinnati, expects to occupy its new plant on the Northside by Sept. 1. It is one of the largest machine tool works in the West.

An extension to the Midvale Steel Co.'s oil tempering plant at Nicetown, Philadelphia, will be 80 x 112 feet and will cost $6,000.

The Buffalo Forge Co., Buffalo, N. Y., has made plans for a 5-story machine shop, 52 x 212 feet, to cost $30,000.

The Spencer Wire Co., Spencer, Mass., is to build a new plant at Worcester for the manufacture of heavy wire. The fine wire plant at Spencer will still be operated.

The Heine Safety Boiler Co., Germantown, Philadelphia, Pa., is reported to have let the contracts for erecting a new plant at Phœnixville, Pa., to employ 200 hands.

Among a number of buildings to be erected at Baltimore by the United Railways & Electric Co. are a car barn, 370 x 363 feet; paint shop, 240 x 310 feet; motor erecting shop, 130 x 210 feet, erecting shop, 270 x 260 feet; power-house, 80 x 100 feet; two machine shops, 90 x 225 and 90 x 368 feet; armature-room, 80 x 90 feet, and two blacksmith shops, each 90 x 200 feet.

The Gray Iron Works of Marion, Ind., have contracted with the Logansport, Ind., Commercial and Manufacturing Association to establish a plant in Logansport and to operate it as the Logansport Foundry Co. Building will begin on the payment of local lot subscriptions.

The prospectus of the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., states that it will provide $5,800,000 for the erection of a steel plant and other enlargements and improvements to its various furnaces, mines, etc. The steel plant proposed will be, if erected, a duplicate of that now building at Ensley City by the Alabama Steel & Shipbuilding Co. at a cost of $1,000,000, and to have daily capacity of 1,000 tons.

A plant for the manufacture of the Lanchester oil motor, to cost $400,000 and to employ about 600 men, is to be built in the Pittsburg district. The Lanchester Motor Co. was organized last week under the laws of New Jersey, with a capital stock of $5,000,000. Percy C. Hamilton, Pittsburg, is a director. The company proposes to manufacture Lanchester oil motors, especially for the use of large freight trucks and street cars, though it has recently secured an option on all the Lanchester oil motor patents in the United States, Canada and Mexico.

Fires and Accidents:—

The three-story works of the Hoffman Bicycle Co., of Cleveland, were partly destroyed by fire Aug. 13. Loss $13,000.

What was known as the "old mill" of the Struthers Iron & Steel Co.'s plant at Struthers, O., was destroyed by fire Aug. 12, with loss of from $50,000 to $60,000. The product is sheets and the mill was full of orders.

Power Equipment and Machine Tools:—

The following recent sales of the Cochrane feed-water heaters and purifiers are reported by the Harrison Safety Boiler Works: Bethlehem (Pa.) Steel Co., 12,000 h. p.; Pennsylvania Mfg., Light & Power Co., Philadelphia, 3,000 h. p.; Waterbury Rope Co., New York, 850 h. p.; Durham Iron Works, Riegelsville, Pa. 600 h. p.; Blodgett Estate, Boston, 300 h. p. Special; Thorley Bldg. (Pabst Brewing Co.), New York, 300 h. p.; Ptitsburg (Pa.) Brewing Co., 600 h. p.; E. P. Allis Co., Milwaukee, Wis., 200 h. p.; American Nut & Bolt Works, Cleveland, O., 350 h. p.; People's Independent Rice Mill Co., Crowley, La., 350 h. p.; Plaza Hotel, New York, 300 h. p. Special; International Paper Co., Franklin Falls, N. H., 350 h. p.; Providence Machine Co., Providence, R. I., 250 h. p.; Lorain Street Railway Co., Lorain, O., 850 h. p.; Warden Power Bldg., Philadelphia, 1,000 h. p.

The Cramp-Hoadley Co., Old Colony Bldg., Chicago, reports a good demand for its Greene-Wheelock engine. It has an order from the Matthiessen & Hegeler Zinc Co., La Salle, Ill., for two very large engines, direct connected to zinc rolls, which is the severest of rolling mill work. This company's engine, with its late improvements, is especially adapted for such work. Simplicity and accessibility are special features. The company has published an attractive catalogue which will be sent upon application.

At the plant of the Stewart Iron Co., Ltd., the Weimer Machine Co. is building one of its 50x96x60-inch blowing engines. The engine fly-wheel is 22 feet in diameter and weighs 30 tons. The engine weighs 350,000 pounds.

The Walburn-Swenson Co., of Chicago, engineers, iron founders and machinists, have been engaged for the past eight months in the manufacture of 300 round bale cotton presses for the American Cotton Co., and now has these presses about completed and shipped. The works have been running 23 hours out of the 24 six days in the week, employing from 300 to 325 men, which is about the limit of its capacity. The company is now having a very good demand for vacuum evaporators, especially for the glue trade, and has closed a number of contracts recently. It is now shipping to D. C. Corbin, of Spokane, Wash., one of the largest and best diffusion batteries ever built, which is to be used in his new beet sugar factory at Waverly, Wash. E. Salich & Co., 802 Monadnock Block, are the engineers, and will soon have this factory ready for occupation.

The American Tool Works, of Cincinnati, has been exceedingly busy of late, and it is reported that its foreign business is assuming such proportions that it is contemplating an addition to its large factories. Recent exports embrace important shipments of machine tools to the British Projectile Co., of London, Eng., and De Fries & Co., of Dusseldorf, Germany. Various consignments, averaging a dozen cases each, were lately made to Berlin, Germany and St. Petersburg and Rostop-on-Don, Russia. An important shipment of drill presses is soon to be sent to Yokohama, Japan.

The Pittsburg District:—

The firm of Thomas Carlin's Sons, Allegheny City, Pa., is to be incorporated as the Thomas Carlin Sons Co, the general organization of the business to remain unchanged.

The combination of nine stove manufacturers in the Pittsburg district will be known as the Pittsburg Stove & Range Co. Application will be made Aug. 31 for a Pennsylvania charter, with $2,000,000 capital stock, half preferred and half common. Walker & Wainwright, of the Times Building, Pittsburg, brokers, managed the consolidation. It is claimed the properties included are worth $1,500,000, of which $500,000 is said to be in real estate, and that the manufacturers were capable independently of earning $1,000,000 a year. The retail stores in Pittsburg conducted by several of the manufacturers will be consolidated. The transfer of the properties will be made through the Union Trust Co., of Pittsburg.

The Pierce-Crouch Engine Co., of Beaver Falls, Pa., has filed a bill in the United States Circuit Court at Pittsburg against the Champion Saw & Gas Engine Co., to restrain it from further manufacture of a certain valve for gas engines, on which a patent is claimed by the plaintiff.

The Drake & Stratton Co., Pittsburg, recently closed a contract with the Fayal Iron Co., which is controlled by the Minnesota Iron Co., in turn controlled by the Federal Steel Co., to strip 600,000 cubic yards of earth at the Fayal mine on the Mesabi range. The cost will be between $300,000 and $400,000. The company took a contract last year to strip about a million yards at the same mine, and this is not yet completed. It is claimed the stripping already done will permit the Fayal mine to produce 1,000,000 tons of ore this year.

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We believe in making our COCHRANE HEATERS of generous proportions, because the slow travel of water through a Heater is an essential in obtaining REAL purification.

Many people seem to think that an ordinary 4x6 handhole is opening enough for dragging out the mud and other stuff which collects in a heater. Of course, if the heater does not stop a lot of impurities a handhole of this size is big enough, but because our **COCHRANE HEATERS** and **PURIFIERS** do take out a lot of scale forming matter, we believe in having openings of liberal size—in making the doors for these easy to open—in making the trays easily removable and interchangeable in providing all the facilities for charging with and removing whatever filtering material is used; in general, making it possible for a man to enter any heater that is big enough to hold him.

You will appreciate these advantages when you come to buy, and you will not have to pay us very much more to get them. The man Who operates the heater will most certainly appreciate them.

It is not only cleaning doors and large capacity, which commend these "COCHRANES" to the steam user—all the other points have received the most careful consideration. May we tell you about them?

HARRISON SAFETY BOILER WORKS, Clearfield & Seventeenth Streets, PHILADELPHIA, PA.

Application has been made for a charter for the consolidation of the railroad coal mines in Western Pennsylvania, under the style of the Pennsylvania Coal Co.

Laughlin & Co., Pittsburg, will blow in this week the Eliza furnace, which has been entirely rebuilt. The new stack is as large as any in existence and will have a capacity of 600 tons a day. The wholly new furnace which is being added to the Eliza group, to be known as No. 4, will be 105 feet high, five feet higher than any other, and will be in operation by the end of the year.

A charter has just been issued for the McKees Rocks Railroad Co. to E. A. Schoen, G. E. Macklin, C. E. Postlewait, Bryan Robertson and Charles V. McGlauchlin. The road will be controlled by the Pressed Steel Car Co. and will extend from the Pittsburg & Lake Erie at McKees Rocks a distance of about four and a half miles, to connect with the Pittsburg, Chartiers & Youghiogheny railroad.

In the United States District Court at Pittsburg last Friday the order restraining the Mesta Machine Co., Pittsburg, from shipping ingot stripping machines outside the jurisdiction of the court, was dissolved. The action had been brought by Henry Aiken, of the Hydraulic Machine Co., to prevent the defendant from shipping certain machines to the Alabama Steel & Shipbuilding Co. The Mesta Machine Co. is thus left free in the matter.

General Industrial Notes:—

Molders at the Deere & Mansur Co.'s works, Moline, Ill., have asked for a 10 per cent increase and for control of the company's molding machines. The company closed the foundry for the time being. A 10 per cent demand is also pending at Deere & Co.'s foundry at Moline.

Cooper, Hewitt & Co.'s Durham Furnace, at Riegelsville, Pa., will be blown in this month.

The Tonawanda Iron & Steel Co. has been buying land on the Niagara River, having taken 20 acres thus far, with negotiations under way for 40 acres more. Together these lands constitute a strip with a river frontage of about one mile. The company needs dumping ground for its furnace slag, and after filling it in with slag and cinder may build dockage.

Samuel E. Light, president of the Lebanon Rolling Mills Co., and other Lebanon, Pa., capitalists have purchased the Lickdale Iron Works, near Lebanon, and the plant will be put in operation about Sept. 1. The works were erected in 1886–87, and contain two 3-gross-ton Bessemer steel converters and one 24-inch blooming mill. They have a daily capacity of about 100 gross tons of billets on single turn. The plant is in good condition.

Fort Payne (Ala.) Furnace was purchased recently by Canadian parties. The machinery, etc., will be removed to Midland, Can., and used in the erection of a charcoal blast furnace. The Fort Payne Furnace was 65 x 14 feet, and was built in 1889–90.

The United States District Court at Pittsburg dissolved the order which restrained the Mesta Machine Co. from shipping machines for stripping ingots. The action was brought by Henry Aiken against the company and against the Alabama Steel & Ship Building Co.

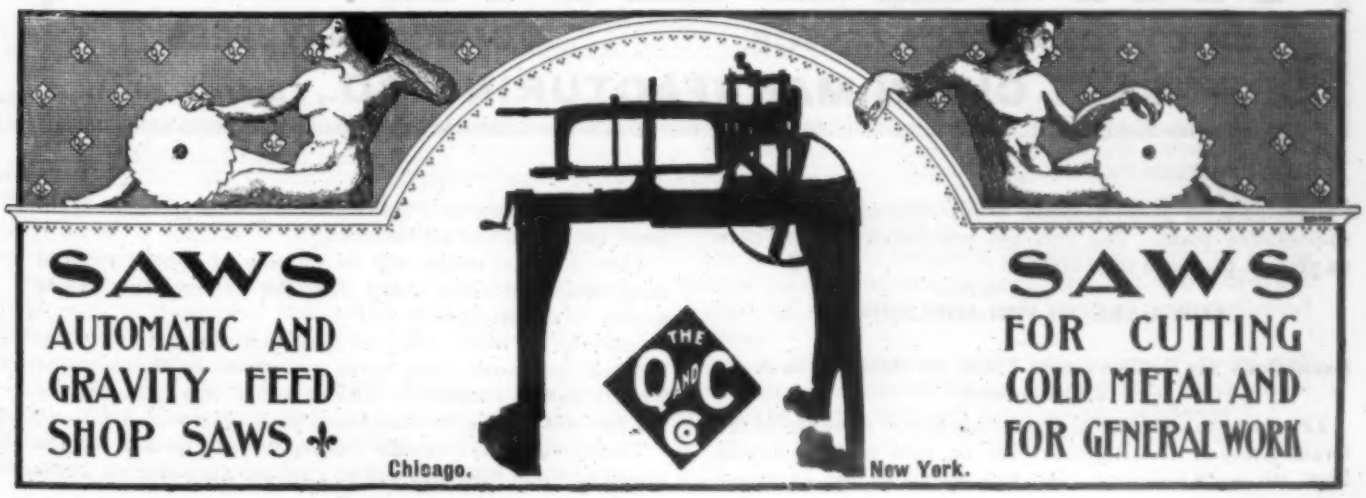
The E. & G. Brooke Iron Co., Birdsboro, Pa., is about to start up its French Creek iron ore mines which have been idle for 10 years.

The Keystone Boiler Co., lately operating at Irwin, Pa., has purchased the car works property at Huntingdon, Pa., and will manufacture heating boilers and radiators, and in addition operate annealing ovens.

A number of improvements are proposed for the Colorado Fuel & Iron Co.'s extensive plants at Pueblo, Col. A blast furnace will probably come first, then additions to the merchant mill; and structural and plate mills are more remote probabilities.

The negotiations of the Republic Iron & Steel Co. for the Union Steel Co.'s plant at Alexandria, Ind., were finally concluded last week. The price is reported at $700,000.

The Cramp Ship & Engine Building Co., Philadelphia, has purchased from the Lehigh Valley a large tract of land in



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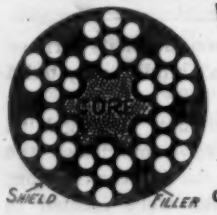

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Excursions via Pennsylvania Lines for National G. A. R. Encampment.

The thirty-third National Encampment and Reunion of the Grand Army of the Republic will be held at Philadelphia Sept. 4th to 9th inclusive. For this event special excursion tickets will be sold to Philadelphia via Pennsylvania Lines Sept. 1st, 2d, 3d and 4th inclusive.

Three forms of tickets will be on sale at special reduced fares, which will be as cheap over the Pennsylvania Route as over any other line.

One cent per mile, except where the one way rate is $11 or less, will be the rate from ticket stations on the Pennsylvania System west of Pittsburg. Tickets sold at this exceptionally low fare will be good for continuous journey in both directions.

Tickets via Baltimore and Washington will be sold at the lowest one-way rate, and will be good for stop-over at Balti-

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more and the National Capitol, and also valid for an additional stop-over in each direction east of Pittsburg.

Tickets via diverse routes (going over one direct route and returning another), will be sold at the single fare rate plus $2. These tickets will also be good for stop-overs at Baltimore and Washington, in addition to one stop-over in each direction east of Pittsburg.

The return limit on all excursion tickets via Pennsylvania Lines will be September 12th, which may be extended to September 30th, inclusive, by depositing tickets with the joint agent at Philadelphia.

All Pennsylvania Lines lead to Philadelphia, and principal points on this system have daily through sleeping car and through coach service to the Quaker City, enabling passengers to go through without changing cars. The route is via Pittsburg and Harrisburg and through the most interesting portions of Pennsylvania.

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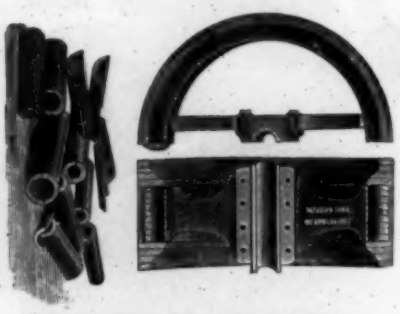

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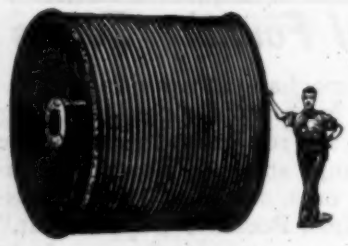

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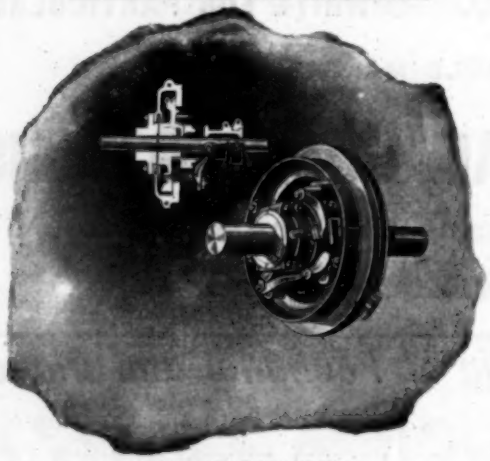

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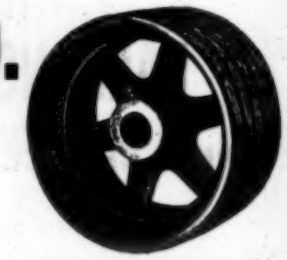

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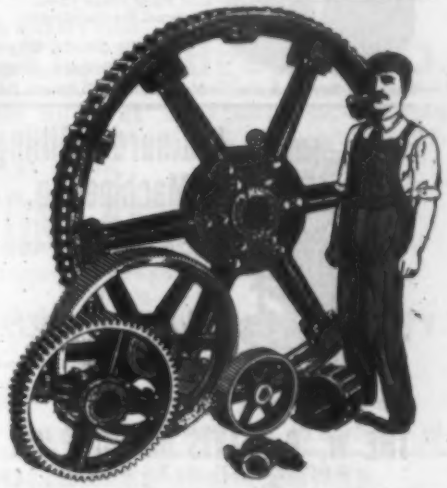

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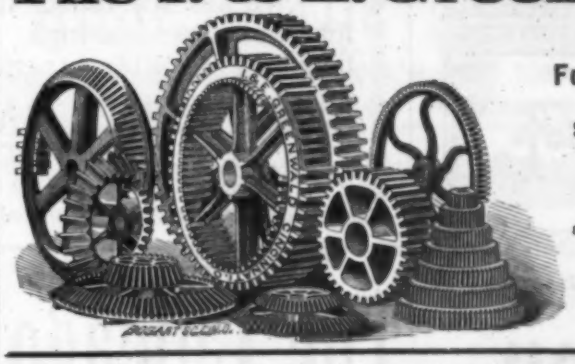

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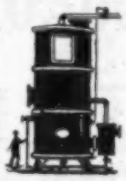

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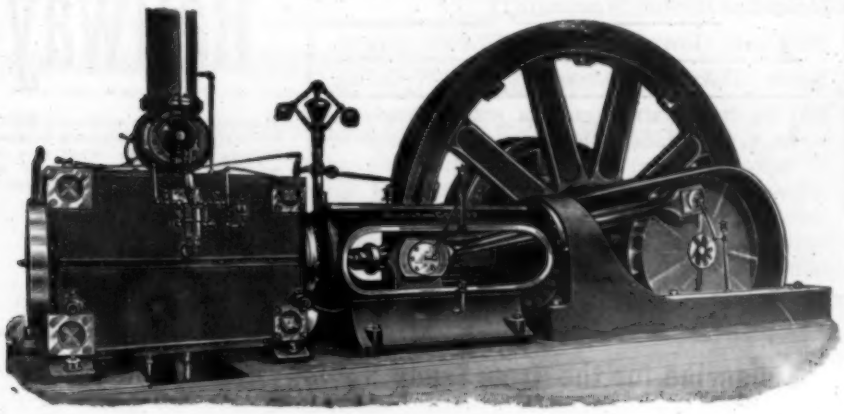

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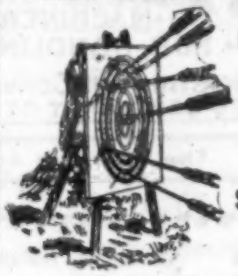

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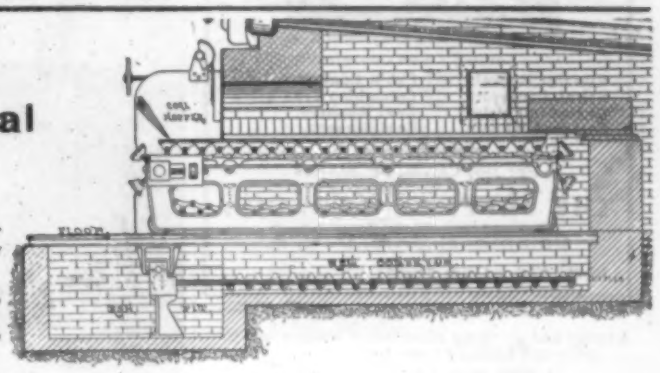

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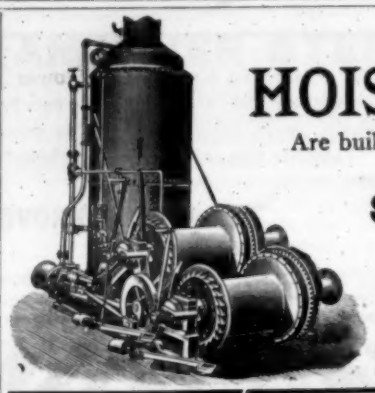

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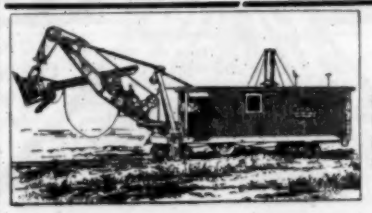

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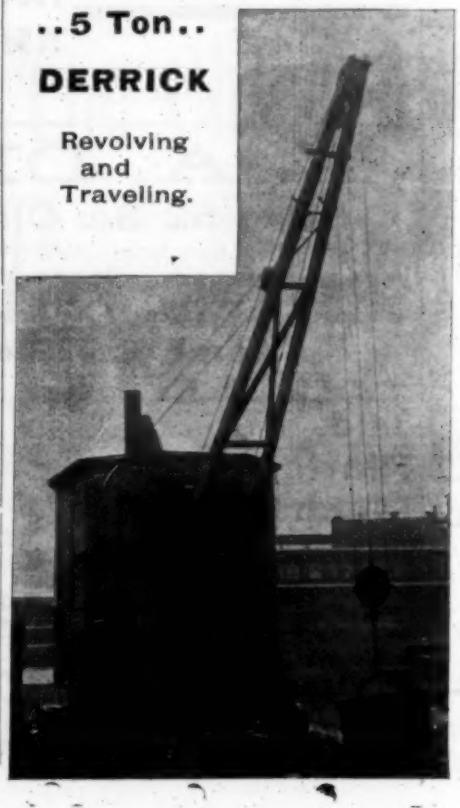

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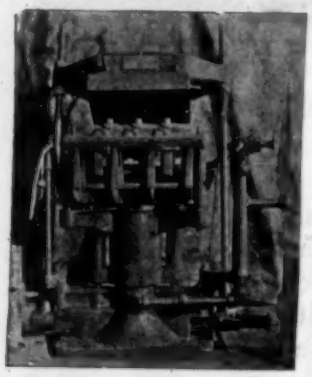

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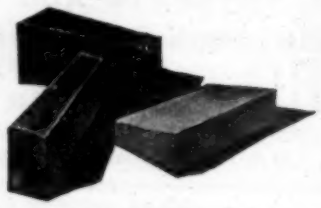

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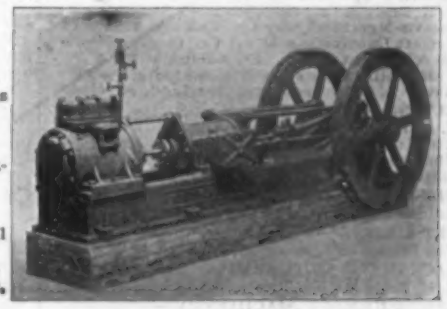

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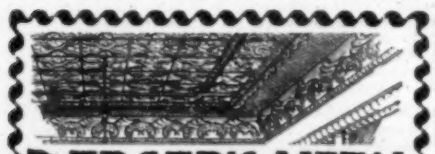

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C. H. Besly & Co., Chicago, Ill.

FLEXIBLE SHAFTS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FLUE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Excelsior Iron Works Co., Cleveland, O.

FOUNDRY SUPPLIES—
Clearfield Fire Brick Co., Clearfield, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. F. Smith & Co., New Brighton, Pa.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Millett Core Oven Co., Brightwood, Mass.
Cleveland Facing Mill Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.
Henry L. Schwarzenberg, Cleveland, O.
King Improved Sand Blast Co., Detroit, Mich.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FORGINGS—
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Bræburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.

FRICTION METAL—
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
Henry L. Schwarzenberg, Cleveland, O.

FURNACES—
Playford Stoker Co., Cleveland, O.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FUEL OIL BURNERS—
W. S. Rockwell & Co., New York City.

GALVANIZED IRON—
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZERS—
Ætna-Standard Iron & Steel Co., Bridgeport, O
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
Brainard Milling Machine Co., Hyde Park, Mass.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR CUTTERS—
Brainadr Milling Machine Co., Hyde Park, Mass.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GREASE—
A. F. Boettcher, Rowlands, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
The Dixon Crucible Co., Jersey City N. J.

GRATE BARS—
Geo. B. Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.

HANGERS—
R. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HOISTS—
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

HEATING AND VENTILATING APPARATUS—
B. F. Sturtevant Co., Boston, Mass.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill
Parkhurst & Wilkinson Co., Chicago, Ill.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Excelsior Iron Works Co., Cleveland, O

HOISTING MACHINERY—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Excelsior Iron Works Co., Cleveland, O.
Earl C. Bacon, New York City.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
Robins Conveying Belt Co., New York City.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

HOTELS—
United States Hotel Co., Cleveland, O.

IMPULSE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

IRON BUILDINGS—
Shiffler Bridge Co., Pittsburg, Pa
Riter-Conley Co., Pittsburg, Pa.

IRON NAILS AND STEEL—
Bethlehem Iron Co., South Bethlehem, Pa
C. H. Besly & Co., Chicago, Ill.
R. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

IRON WORKING TOOLS—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
The F. B. Shuster Co., New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Ball & Screw Co., Cleveland, O.
W. P. Davis Machine Co., Rochester, N. Y.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

LUBRICATORS—
A. F. Boettcher, Rowlands, Pa.

MACHINISTS' TOOLS AND SUPPLIES—
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Berisch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.
H. A. Streeter, Chicago, Ill.
Danielson Machine & Tool Co., Cleveland, O

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.

MALLEABLE CASTINGS—
Acme Malleable Iron Works, Buffalo, N. Y.

MANUFACTURING CHEMISTS—
We Fu Go Co., Cincinnati, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Ætna-Standard Iron & Steel Co. Bridgeport, O
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.
Republic Iron & Steel Co., Chicago Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.

METAL BEARINGS—
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
Swarts Metal Refining Co., Chicago, Ills
F. R. Phillips' Sons Co., Philadelphia, Pa.
Henry L. Schwarzenberg, Cleveland, O.

MILLING MACHINES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa
Brainard Milling Machine Co., Hyde Park, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New Yrok City.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
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The Lane & Bodley Co., Cincinnati, O.
Jeffrey M'f'g Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago Ill.
James Bonar & Co., Pittsburg, Pa.

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

ORE CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

PACKING
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
The Shearer-Peters Paint Co., Cincinnati, O.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland, O.

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Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.

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Forster, Waterbury & Co., Chicago, Ill.
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M. A. Hanna & Co., Cleveland, O.
R. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.

PIPE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

PIPE COVERING—
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Jenkins Bros., New York City.

PIPE CUTTING AND THREADING MACHINES—
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PLANERS—
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U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Manning, Maxwell & Moore, New York City.

PLATES—
Enterprise Boiler Co., Youngstown, O.
Republic Iron & Steel Co., Chicago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
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Q & C Co., Chicago, Ill.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.
Vulcan Mfg. Co., Pittsburg, Pa.

POWER DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield Mass.

POWER PRESSES—
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R. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

POWER TRANSMISSON MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
R. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.

PULLEYS—
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The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.

PUMPS (STEAM)—
The Edward P. Allis Co Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin Ill.
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.

PUNCHES—
R. Konigslow & Bro. Cleveland, O.

PYROMETERS—
Edward Brown, Philadelphia, Pa
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.

RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.

RIVETS—
Champion Rivet Co. Cleveland, O.
Jonse & Laughlins, Ltd., Pittsburg, Pa.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co. Youngstown, O.

ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

ROLLING MILL MACHINERY—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa

ROOFS—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

SAND BLAST MACHINES—
King Improved Sand Blast Co., Detroit, Mich.

SAWS—
Peter Gerlach & Co., Cleveland, O.

SCREENS FOR COAL, ORE, ETC.—
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.

The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co. Chicago, Ill

SCREW MACHINES—
Cleveland Ball & Screw Co., Cleveland, O.

SEAMLESS TUBES—
Shelby Steel Tube Co., Cleveland, O.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

SHAFTING—
The Lane & Bodley Co. Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland O.
The Aultman Co, Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa.

SHAPERS—
W. P. Davis Machine Co., Rochester, N. Y.
Baush & Harris Machine Tool Co., Springfield, Mass.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.

SHEET IRON—
Cleveland Rolling Mill Co, Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
R. H. Stroud & Co., Chicago Ill.
Republic Iron & Steel Co., Chicago, Ill.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

SPECIAL MACHINERY—
Edwin Harrington Son & Co., Philadelphia.
Q & C Co., Chicago, Ill
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
R. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.

STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.

STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co., Hartford Conn.

STEAM PIPE AND BOILER COVERING—
C. H. Besly & Co Chicago Ill

STEAM PACKING—
C. H. Besly & Co., Chicago, Ill.

STEAM PUMPS—
Hall Steam Pump Co., Pittsburg, Pa.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

STEAM SEPARATORS—
James Bonar & Co., Pittsburg, Pa.
Austin Separator Co., Detroit, Mich.
Harrison Safety Boiler Works, Philadelphia, Pa.

STEAM SHOVELS AND DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

STEAM SPECIALTIES—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

STEEL—
Otis Steel Co., Cleveland, O.
R. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.
American Steel Hoop Co, Pittsburg, Pa.

STEEL BALLS—
Cleveland Ball & Screw Co., Cleveland, O.

STEEL BANDS—
American Steel Hoop Co, Pittsburg, Pa.

STEEL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

STEEL CASTINGS—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.

STEEL HOOPS—
American Steel Hoop Co., Pittsburg, Pa.

STEEL PLANTS—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.

STEEL BLOOMS AND BILLETS—
Bethlehem Steel Co., South Bethlehem, Pa.
Ohio Steel Co., Youngstown, Ohio.
The Lorain Steel Co., Lorain, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
American Steel Hoop Co., Pittsburg, Pa.

STEEL STAMPS AND STENCILS—
J. H. Fleharty & Co., Cleveland, O.

STEEL TUBES—
Shelby Steel Tube Co. Cleveland, O.

STOKERS—
Playford Stoker Co., Cleveland, O.

TANKS—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, O
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.

TANK CARS—
The Wm. B. Pollock Co., Youngstown, O.

TIN AND TERNE PLATES—
R. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, Chicago, Ill.

TIN PLATE MACHINERY—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.

TOOL STEEL—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Monongahela Iron & Steel Co., Pittsburg, Pa.

TRANSMISSION MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Link Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
W. A. Jones Foundry & Machine Co., Chicago, Ill
Jeffrey Mfg. Co., Columbus, O
Dodge Mfg. Co. Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

TUBES—
National Tube Works, McKeesport, Pa.
Shelby Steel Tube Co., Cleveland, O.
S. Fix' Sons, Cleveland, O.

TUBE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

TUBE WELDING—
S. Fix Sons, Cleveland, O.

TURNBUCKLES—
Republic Iron & Steel Co, Chicago, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.

WIST DRILLS—
C. H. Besly & Co., Chicago, Ill.

TWIST DRILL CASES—
Vulcan Mfg. Co., Pittsburg, Pa.

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WIRE FILLER—
The Ironsides Company, Columbus, O.

WIRE MACHINERY—
The F. B. Shuster Co., New Haven, Conn.
S. W. Goodyear, Waterbury, Conn.

WIRE ROPE COATING—
The Ironsides Company, Columbus, O.

WIRE ROPE FILLING—
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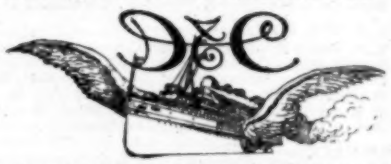

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UNPARALLELED NIGHT SERVICE. NEW STEAMERS
"CITY OF BUFFALO"
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50 ROOMS AT $2.00
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All Meals 50¢ Each

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FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.
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MORE WEAR from your tools
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All Sizes Made to Order.

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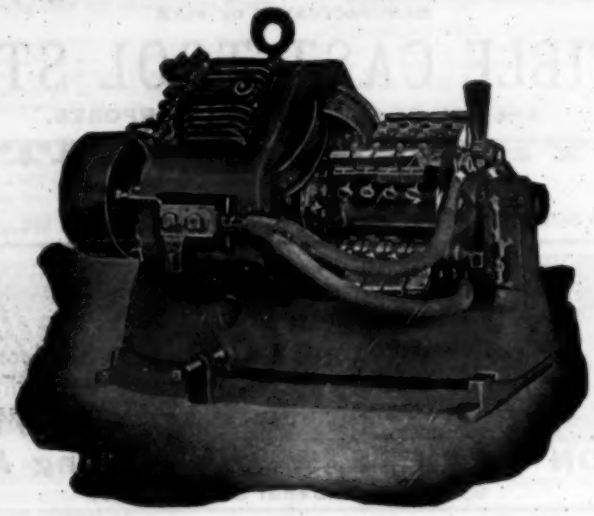

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OHIO.

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That is the testimony of the shrewdest and livest of them.

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IRON ORE.

[On Lake Erie Docks.]

Special low-phosphorus hard ore, Bessemer	$4.50
No. 1 Specular, Bessemer	$3.50@ 4.25
No. 1 Bessemer, hematite	3.00@ 4.05
Hematites No. 1 non-Bessemer	2.25@ 2.70
No. 1 Specular, non-Bessemer	2.00@ .75
Mesabi Bessemer	2.50@ .00

PIG IRON.

Cleveland (f. o. b. cars):

Bessemer	$21.75
No 1 Strong Foundry	$20.75@ 21.75
No. 2 Strong Foundry	20.25@ 21.25
Gray Forge red short	18.75@ 19.25
No. 1 American Scotch	20.75@ 21.75
No 2 American Scotch	20.25@ 21.75
Lake Superior Charcoal	22.00@ 23.00

OLD RAILS AND SCRAP METAL

[Delivered Cleveland.]	Gross Tons.
Old iron rails	$20.50
Old steel rails (6 ft. and over)	16.00
Old steel rails (6 ft. and under)	16.00
Old car wheels	17.00
	Net Tons.
No. 1 R. R. wrought scrap	$17.00
Mill scrap	12 50
No. 1 Machine cast scrap	13.50
Iron axles	20 00
Axle turnings	11.00
Wrought turnings (free from cast)	10.00
Cast borings	9.00
Uncut wrought iron boilers	7 00
Steel boiler plates	12.00
Grate bars	9 00
Pipes and flues (clean)	11.00
Tank Iron	12.00
Hoop and band iron	9.00
Sheet iron	8.00
Wrought drillings	10 00
Malleable iron	10.50

STRUCTURAL MATERIAL.

Beams and channels (f. o. b. Cleveland)	2.10c
Angles	2.10@ 2.25c
Tees	2.15c
Universal plates	2.60@ 2.75c
Sheared plates	2.75c

MERCHANT IRON & STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares—Bar Iron.

1 to 1⅞	2c Base.
2 to 2¾	.20 extra.
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6½	2.20 "
6⅞ to 7⅛	2.50 "
¼ to ⅜	.10 "
⅜ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅝ to 13-32	.50 "
5-16 to 17-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1⅛ to 4 x ⅜ to 1	1.05 Base
4⅛ 0 6 x ⅜ to 1	.10 extra
6⅛ 0 8 x ⅜ to 1	.60 "
8⅛ 0 10 x ⅜ to 1	.80 "
1⅛ 0 4 x 1 1-16 to 1⅜	.30 "
4⅛ to 6 x 1 1-16 to 1⅜	.40 "
6⅛ to 8 x 1 1-16 to 1⅜	.60 "
8⅛ to 10 x 1 1-16 to 1⅜	.90 "
2 to 4 x 1⅜ to 2	.50 "
4⅛ to 6 x 1⅜ to 2	.60 "
6⅛ to 8 x 1⅜ to 2	.80 "
8⅛ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅜ to 3	.60 "
4⅛ to 6 x 2⅜ to 3	.80 "
6⅛ to 8 x 2⅜ to 3	1.00 "
1⅛ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
⅛ to 15-16 x ⅜ to ⅞	.40 "
⅝ to 11-16 x ⅜ to ⅞	.50 "
⅛ to 9-16 x ⅜ to ⅞	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6⅛ to 6⅜ x ¼ to 5-16	.50 "
4⅛ to 6 x ¼ to 5-16	.30 "
1⅛ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
⅛ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅛ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6⅛ to 6⅜ x No. 9 to 3-16	.70 "
6⅛ to 6⅜ x Nos. 10, 11 and 12	.80 "
4⅛ to 6 x No. 9 to 3-16	.50 "
4⅛ to 6 x Nos. 10, 11 and 12	.60 "
1⅛ to 4 x No. 9 to 3-16	.40 "
1⅛ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "

7-16 to ½ x No. 9 to 3-16	1.30 extra
7-16 to ½ x Nos. 10, 11 and 12	1.40
½ x No. 9 to 3-16	1.50
½ x Nos. 10, 11 and 12	1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1⅜	.40 extra
½ to 13-16	.50 "
½ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅜ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¾ to 3	.60 extra
⅝ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness extra price.

Horse Shoe Iron.

All sizes .1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base. Extras.	
1¼ to 6,	" 10, 11, 12 or ⅛"	.05	per 100 lbs
1 to 1¼,	" 7, 8, 9 or 3-16"	.10	"
1 to 1¼,	" 10, 11, 12 or ⅛"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or ⅛"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10, 11, 12 or ⅛"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10, 11, 12 or ⅛"	.45	"
½,	Nos. 7, 8, 9 or 3-16"	.55	"
½,	" 10, 11, 12 or ⅛"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-16	" 10, 11, 12 or ⅛"	.85	"
⅜,	" 7, 8, 9 or 3-16"	.95	"
⅜,	" 10, 11, 12 or ⅛"	1.05	"

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.		
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base. Extras.	
7-16 to 2,	" 17, 18, and 19	.05	per 100 lbs
7-16 to 2,	" 20	.10	"
7-16 to 2,	" 21	.15	"
7-16 to 1⅜,	" 22	.25	"
½ to 1⅜,	" 13, 14 and 15	.05	"
1⅜ to 1⅜,	" 19 and 20	.10	per 100 lbs
1⅜ to 1⅜,	" 21	.20	"
1⅜ to 1⅜,	" 22	.30	"
15-16 and 1,	" 13, 14 and 15		"
15-16 and 1,	" 16, 17 and 18	.15	"
15-16 and 1,	" 19 and 20	.20	"
15-16 and 1,	" 21	.25	"
15-16 and 1,	" 22	.35	"
⅝,	Nos. 13, 14 and 15	.20	"
⅝,	" 16, 17 and 18	.25	"
⅝,	" 19 and 20	.30	"
⅝,	" 21	.35	"
⅝,	" 23	.45	"
¾ and 13-16	Nos. 13, 14 and 15	.30	"
¾ and 13-16	" 16, 17 and 18	.35	"
¾ and 13-16	" 19 and 20	.40	"
¾ and 13-16	" 21	.45	"
¾ and 13-16	" 22	.50	"
¾ and 13-16	" 23	.60	"
11-16,	Nos. 13, 14 and 15	.35	"
11-16,	" 16, 17 and 18	.40	"
11-16,	" 19 and 20	.50	"
11-16,	" 21	.60	"
11-16,	" 22	.70	"
11-16,	" 23	.80	"
⅝,	Nos. 13, 14 and 15	.40	"
⅝,	" 16, 17 and 18	.45	"
⅝,	" 19 and 20	.55	"
⅝,	" 21	.65	"
⅝,	" 22	.75	"
⅝,	" 23	.85	"
9-16,	" 13, 14 and 15	.45	"
9-16,	" 16, 17 and 18	.50	"
9-16,	" 19 and 20	.60	"
9-16,	" 21	.70	"
9-16,	" 22	.80	"
9-16,	" 23	.90	"
⅝,	" 13, 14 and 15	.55	"
⅝,	" 16, 17 and 18	.60	"
⅝,	" 19 and 20	.70	"
⅝,	" 21	.80	"
⅝,	" 22	.90	"
⅝,	" 23	1.00	"
7-16,	" 13, 14 and 15	.80	"
7-16,	" 16, 17 and 18	.90	"
7-16,	" 19 and 20	1.00	"
⅜,	" 13, 14 and 15	1.00	"
⅜,	" 16, 17 and 18	1.10	"
⅜,	" 19 and 20	1.20	"

Sheet Iron.

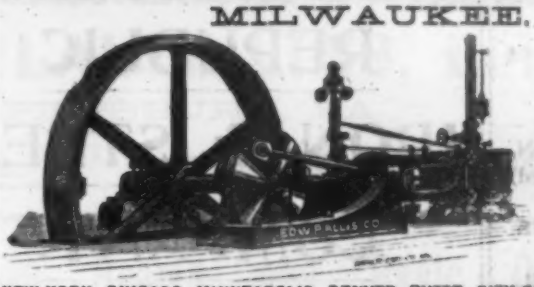
No. 10	2 35
No. 12	2 35
No. 14	2 45
No. 15-17	2 50
No. 18	2 65
No. 20	2 80
No. 22-24	2 80
No. 25-26	3 00
No. 27	3 20

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 50
Shell	2 60
Flange	2 75
Marine Flange	3 00
Fire Box	3¼

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



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Weiss Counter-Current Condensers.

THE LANE & BODLEY CO.,

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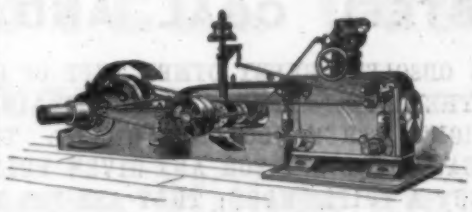

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ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pullevs.

Belt Elevators, Saw Mills.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

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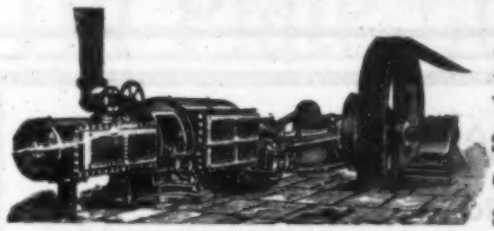

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And Other Specialties.

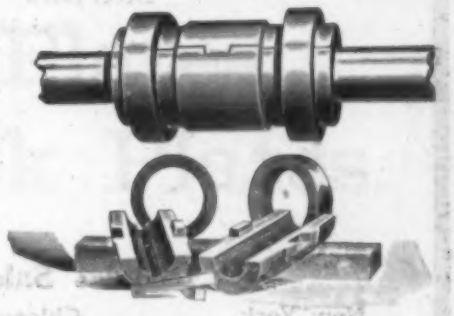
We do not claim novelty in these Couplings so much as good material, good workmanship and extreme simplicity. We make them of a very strong cast iron, with wrought iron bands.

We make also the

SENNETT ENGINE

20 to 40 H. P.

Foundry contracts solicited for duplicate castings, from 10 lbs. to 5 tons each.



Above includes plates 90 inches wide.	
90 to 96 in. wide	½c. lb extra
96 to 100 in. wide	1½c. "
100 to 104 in. wide	3c. "
104 to 106 in. wide	special

Wrought Pipe and Boiler Tubes.

Merchant pipe, from store	dis. 50 and	10
Boiler tubes, 1¼ to 1⅜ inch	Discount	35
" " 1½ to 2⅜ inch, iron,	"	45
" " " " steel,	"	50
" " 2½ to 4 inch, iron,	"	50
" " " " steel,	"	52½
Casing, screw and socket joint	"	45
Casing, inserted joint	"	35

Manufacturers of
BAR IRON,
BAR STEEL,
PLATES,
PIG IRON,
SHEETS (Black & Galvanized)
BOLTS and NUTS,
TURNBUCKLES
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COLD ROLLED STEEL,
SPIKES, ANGLES,
CUT NAILS,
HARROW TEETH,
STEEL FENCE POSTS,
STEEL WHIFFLE TREES,
AGRICULTURAL SHAPES.

REPUBLIC
IRON & STEEL
COMPANY.

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HAVE MADE OBSOLETE EVERY OTHER TYPE OF CARS FOR BULK FREIGHT. THEY ADD FORTY PER CENT TO TRAIN CAPACITY, FOR PAYING FREIGHT; THEY DOUBLE CAR LIFE; THEY DECREASE NUMBER OF CARS REQUIRED FOR ANY GIVEN BULK OF FREIGHT; THEY COST BUT A TRIFLE MORE; THEY ARE FOR THEIR PURPOSE,

THE CHEAPEST AND BEST CARS IN THE WORLD.

PRESSED STEEL CAR COMPANY.

PITTSBURGH. NEW YORK. CHICAGO. JOLIET.

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General Offices: PITTSBURG.

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Angles
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Chicago, Marquette Building
St. Louis, Fullerton Building
St. Paul, Endicott Building
San Francisco, 23 Davis Street

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WM. B. FRANKLIN, Vice-President.
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JONES & LAUGHLINS, Limited,

PITTSBURG, PA.

Branch House, CHICAGO, ILL. Branch Office, 220 Broadway, NEW YORK.

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Bessemer, Acid Open Hearth and Basic Open Hearth

STEEL.

THE

LORAIN STEEL COMPANY,

Lorain, Ohio.

Rails, Blooms, Billets and Slabs.

American Tin Plate Company

MANUFACTURERS OF

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Charcoal Tin Plates,

High Grade Terne Plates,

Black Plates.

GENERAL OFFICES:

Marquette Building.

CHICAGO, ILL.

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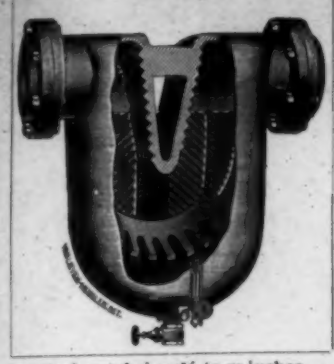

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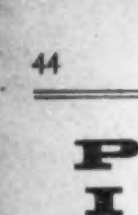

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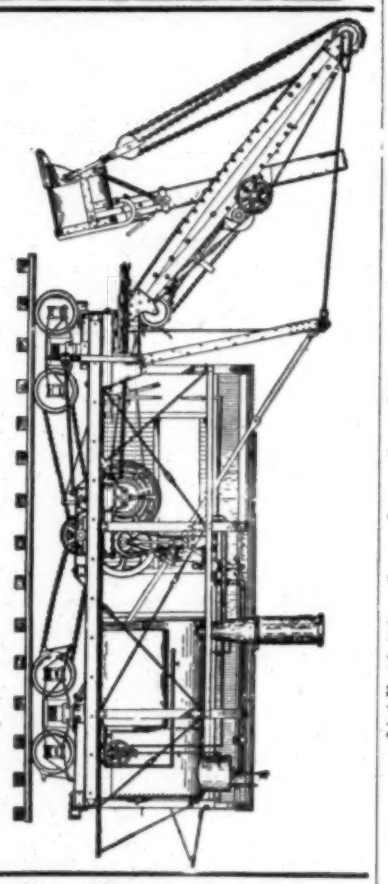

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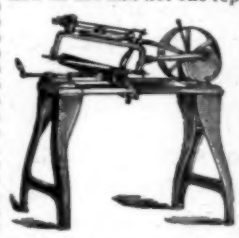

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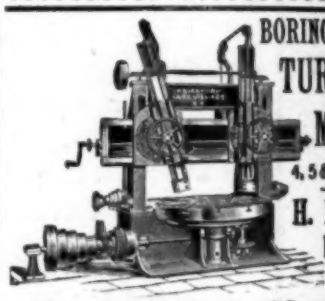

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